IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZQGA-C-D (SUPERSEDES ALL EARLIER PROGRAMS IN THE SERIES MAINDEC-11-D9H AND MAINDEC-11-DZQGA)
PRODUCT NAME:	GENERAL TEST PROGRAM (GTP) 8K OF MEMORY REQUIRED
DATE CREATED:	JULY, 1973
MAINTAINER:	DIAGNOSTIC GROUP
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DIGITAL EQUIPMENT CORPORATION

FACTORY ACCEPTANCE

SR1: - - - - - -
SR2: - - - - - -
SR3: - - - - - -

FIELD ACCEPTANCE

SR1: - - - - - -
SR2: - - - - - -
SR3: - - - - - -

THE ABOVE SWITCH REGISTER SET UP WAS USED TO ACCEPT THIS CONFIGURATION

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1. ABSTRACT

THIS PROGRAM IS AN INTERACTIVE MULTI-DEVICE EXERCISER. THE PROGRAM OPERATES IN BACKGROUND-FOREGROUND MODE WITH PROCESSOR AND IN-LINE DEVICE TEST CODE AS THE BACKGROUND AND INTERRUPT DRIVEN DEVICE TEST CODE AS THE FOREGROUND. IN THIS MANNER, THE CENTRAL PROCESSOR MAY BE EXERCISED CONCURRENTLY WITH THE TEST OF ANY, OR ALL OF THE DEVICES THAT OPERATE IN THE INTERRUPT MODE.

IF AN ERROR OCCURS IN ANY OF THE DEVICES THAT HAVE BEEN SELECTED FOR TESTING, IT IS RECOMMENDED THAT THE INDIVIDUAL DIAGNOSTIC FOR THE DEVICE THAT FAILED BE USED TO CORRECT THE MALFUNCTION.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11/10 OR
PDP-11/20 OR
PDP-11/40 OR
PDP-11/45 PROCESSOR
8KW OF MEMORY

2.1.1 OPTIONAL HARDWARE THAT THE PROGRAM WILL EXERCISE OR INTERACT WITH

AA11	DIGITAL TO ANALOG CONVERTER WITH SCOPE
AD01	ANALOG TO DIGITAL CONVERTER
AFC11	LOW LEVEL ANALOG MULTIPLEXER AND CONVERTER
BM792YA	DIODE BOOT FOR PAPER TAPE
BM792YB, MR11-DB	DIODE BOOT FOR TC11,RC11,RF11,RK11 AND RP11
CD11	CARD READER
CM11	CARD READER
CR11	CARD READER
DC11	ASYNCHRONOUS LINE UNIT
DM11	ASYNCHRONOUS MULTIPLEXER
DM11-BB	MODEM CONTROL MULTIPLEXER
DN11	DIGITAL DIALER
DP11	SYNCHRONOUS LINE UNIT
DR11-A	DEVICE REGISTER INTERFACE (INTERRUPT ONLY)
DR11-B	GENERAL DEVICE REGISTER INTERFACE (NPR)
DR11-C	DEVICE REGISTER INTERFACE (INTERRUPT ONLY)

2.1.1 OPTIONAL HARDWARE CONTINUED

DT11	BUS SWITCH
KE11	ARITHMETIC UNIT
KG11	REDUNDANY CHECK OPTION
KL11	ASR 33 OR 35 (VT05,VT06,LC11)
KT11	MEMORY MANAGEMENT OPTION
KW11-L	LINE CLOCK
KW11-P	PROGRAMMABLE CLOCK
LP11	LINE PRINTER
MM11	UP TO 28KW OF MEMORY
PC11	HIGH SPEED READER/PUNCH
RC11	DISK 64KW
RF11	DISK 256KW
RK11	DISK (IBM TYPE 2315)
RP11	DISK
TC11	DECTAPE
TM11	MAGNETIC TAPE - INDUSTRY COMPATIBLE
UDC11	UNIVERSAL DIGITAL CONTROLLER

2.1.2 HARDWARE EXERCISED IF PRESENT (NOT SWITCH REGISTER INHIBITABLE)

KE11-E	EIS FOR PDP 11/40
KE11-F	FIS FOR PDP 11/40
FP11	FLOATING POINT PROCESSOR

2.2 STORAGE

2.2.1 PROGRAM STORAGE

THE PROGRAM USES MEMORY LOCATIONS 000000-37450.
IF MEMORY EXPANSION HAS BEEN SELECTED, THE PROGRAM
WILL USE ALL AVAILABLE MEMORY UP TO 1000 BYTES (OCTAL)
FROM THE END OF THE LAST AVAILABLE BANK, OR 1000 BYTES
BELOW THE END OF 28K, WHICHEVER IS LESS.

3. LOADING PROCEDURE

3.1 METHOD

PROCEDURE FOR NORMAL ABSOLUTE TAPES SHOULD BE FOLLOWED.

4. STARTING PROCEDURE

4.1 STARTING PROCEDURE FOR SINGLE PROCESSOR, SINGLE BUS SYSTEMS

4.1.1 LOAD PROGRAM INTO MEMORY.

NOTE: THE PROGRAM IS INITIALIZED WITH A SPECIFIC DEVICE REGISTER
AND VECTOR ASSIGNMENT FOR FLOATING VECTOR DEVICES.
TO ACCOMODATE OTHER CONFIGURATIONS, APPROPRIATE CHANGES
SHOULD BE MADE IN THE "DEVICE REGISTER AND VECTOR
TABLE" (SEE LISTING) AFTER THE PROGRAM HAS BEEN LOADED.

4.1.2 SET SWITCH REGISTER TO STARTING ADDRESS 000200.
PRESS LOAD ADDRESS.

4.1.3 SET UP DEVICE INHIBIT SWITCHES AS DESCRIBED BELOW

NOTE: IF THE SWITCH REGISTER=0, UPON INITIAL START,
THE PROGRAM WILL PROCEDE DIRECTLY TO 4.1.6, AND NO DEVICES
WILL BE TESTED.

NOTE: IF A NON-EXISTENT DEVICE IS SELECTED IN ANY OF
THE THREE DEVICE INHIBIT SETTINGS, A BUS ERROR TRAP WILL
OCCUR AND THE PROGRAM WILL HALT AT LOCATION 000006.

AFTER STARTING ADDRESS HAS BEEN LOADED:

SW00=1 INHIBIT DT11 BUS SWITCH SELECTION
SW01=1 INHIBII MULTI-PROCESSOR TESTING
SW02=1 INHIBII PC11 HSP
SW03=1 INHIBIT PC11 HSR
SW04=1 INHIBTI KW11-L LINE CLOCK
SW05=1 INHIBIT CR11 CARD READER
SW06=1 INHIBIT KW11-P PROGRAMMABLE REAL TIME CLOCK
SW07=1 INHIBIT LP11 LINE PRINTER --- IF LINE PRINTER IS USED, MUST RESTART AT 600
SW08=1 INHIBII SECTION ONE AND TWO OF THE BUS TESTER (FACTORY USE ONLY)
SW09=1 INHIBIT SECTION THREE AND FOUR OF THE BUS TESTER (FACTORY USE ONLY)
SW10=1 INHIBI1 RF11 DISK
SW11=1 INHIBIT UDC11
SW12=1 INHIBI1 RC11 DISK
SW13=1 INHIBI1 TC11 DECTAPE
SW14=1 INHIBI1 KL11 TTY OUTPUT
SW15=1 INHIBIT KL11 TTY INPUT

PRESS START.

4.1.4 PROGRAM WILL HALT.
SET UP DEVICE INHIBIT SWITCHES AS DESCRIBED BELOW

AFTER FIRST HALT
SW00=1 INHIBIT DC11 #1 .... VECTOR 300
SW01=1 INHIBIT DC11 #2 .... VECTOR 310
SW02=1 INHIBIT AA11 DAC WITH SCOPE OPTION
SW03=1 INHIBIT AFC11 ANALOG MULTIPLEXER
SW04=1 INHIBIT RK11 DISK
SW05=1 INHIBIT DR11-B GENERAL INTERFACE (NPR)
SW06=1 INHIBIT KE11 EXTENDED ARITHMETIC ELEMENT
SW07=1 INHIBIT AD01-D A/D CONVERTER
SW08=1 INHIBIT RP11 DISK
SW09=1 INHIBIT BUS LATENCY TESTER (FACTORY USE ONLY)
SW10=1 INHIBIT DN11 DIGITAL DIALER
SW11=1 INHIBIT TM11 MAGNETIC TAPE
SW12=1 INHIBIT M792YA (DIODE BOUT FOR PC11,KL11)
SW13=1 INHIBIT M792YB,MR11-DB (RF, RC, RK AND TC11) BOOT
SW14=1 INHIBIT DP11 SYNCHRONOUS LINE UNIT --- VECTOR 320
SW15=1 INHIBIT DM11 ASYNCHRONOUS MULTIPLEXER --- VECTOR 330
PRESS CONTINUE.

4.1.5 PROGRAM WILL HALT.
SET UP DEVICE INHIBIT SWITCHES AS DESCRIBED BELOW

AFTER SECOND HALT
SW00=1 INHIBIT KG11-A REDUNDANCY CHECK OPTION
SW01=1 INHIBIT CD11 CARD READER
SW02=1 INHIBIT DR11-A, DR11-C GNENERAL INTERFACE (INTERRUPT ONLY)
SW03=1 INHIBIT DM11-BB MODEM CONTROL MULTIPLEXER
SW04=1 INHIBIT VR20 2 COLOR SCOPE OPTION
SW05=1 INHIBIT KT11 MEMORY MANAGEMENT OPTION
SW06=1 INHIBIT RESERVED
SW07=1 INHIBIT RESERVED
SW08=1 INHIBIT RESERVED
SW09=1 INHIBIT RESERVED
SW10=1 INHIBIT RESERVED
SW11=1 INHIBIT RESERVED
SW12=1 INHIBIT RESERVED
SW13=1 INHIBIT RESERVED
SW14=1 INHIBIT RESERVED
SW15=1 INHIBIT RESERVED

PRESS CONTINUE.

4.1.6 PROGRAM WILL HALT.
SET SWITCHES AS DESCRIBED IN SECTION 5.1.2.
WORST CASE IS ALL SWITCHES DOWN.
PRESS CONTINUE.

4.1.7 THE PROGRAM WILL BEGIN TEST EXECUTION.

NOTE: A MINIMUM OF TWO PASSES SHOULD BE RUN.

4.2 STARTING PROCEDURE FOR SYSTEMS WITH BUS SWITCH

4.2.1 PUT BUS SWITCH INTO MANUAL MODE AND CONNECT TO PROCESSOR INTO WHICH PROGRAM IS TO BE LOADED.

4.2.2 LOAD PROGRAM INTO MEMORY

4.2.3 SET SWITCH REGISTER TO STARTING ADDRESS 000200
PRESS LOAD ADDRESS

4.2.4 SELECT DEVICES AS DESCRIBED IN 4.1.3 TO 4.1.5, WITH THE FOLLOWING EXCEPTIONS.

AFTER THE STARTING ADDRESS HAS BEEN LOADED, SW00 MUST BE SET TO 0 TO PERMIT BUS SWITCH SELECTION BY THE PROGRAM.

AFTER THE FIRST HALT, SW01 MUST BE SET TO 0 IF THE PROGRAM IS TO BE RUN IN MULTI-PROCESSOR MODE.

4.2.5 AFTER DEVICE SELECTION HAS BEEN ACCOMPLISHED, SWITCH THE BUS SWITCH TO THE OTHER PROCESSOR AND REPEAT 4.2.2 TO 4.2.4 FOR THE OTHER PROCESSOR

4.2.6 PLACE BUS SWITCH IN PROGRAMMABLE MODE.

4.2.7 PERFORM 4.1.6 FOR EACH PROCESSOR
PROGRAM WILL BEGIN TEST EXECUTION

4.3 STARTING PROCEDURE WITH OVERLAY

4.3.1 LOAD GTP

4.3.2 LOAD OVERLAY

NOTE: IF MEMORY EXPANSION IS TO BE RUN, THE OVERLAY MUST BE LOADED INTO MEMORY STARTING AT LOCATION 40000 (OCTAL)

4.3.3 LOAD GTP STARTING ADDRESS

4.3.4 SELECT DEVICES AS DESCRIBED IN 4.1.3 TO 4.1.5

NOTE: IF THE OVERLAY HAS AN INITIALIZATION SECTION, PROGRAM CONTROL WILL BE TRANSFERED TO THE OVERLAY WHEN CONTINUE IS PRESSED. THE APPROPRIATE ACTION MAY NOW BE TAKEN TO INPUT ANY INFORMATION TO THE OVERLAY THAT IS REQUIRED. THE INITIALIZATION CODE WILL RETURN CONTROL TO GTP AT LOCATION "RUNSW" FOR SETUP OF OPERATIONAL SWITCHES.

4.3.5 PERFORM 4.1.6
PROGRAM WILL BEGIN TEST EXECUTION

5. OPERATING PROCEDURE

5.1 SWITCH REGISTER OPTIONS

SW15=1 UP---HALT ON ERROR
SW14=1 UP---SCOPE LOOP - PROCESSOR TEST
SW13=1 UP---INHIBIT PRINT OUT
SW12=1 UP---FREEZE PROCESSOR IN CURRENT MODE
SW11=1 UP---INHIBIT SUB-PROBLEM ITERATION
SW10=1 UP---INHIBIT PROCESSOR TEST
SW09=1 UP---INHIBIT MEMORY EXPANSION
SW08=1 UP---ISOLATION--BY DROPOUT
SW07=1 UP---SWITCH ERROR MESSAGES TO HIGH SPEED PUNCH
SW06=1 UP---RESTART PROGRAM ON ERROR
SW05=1 UP---RESERVED
SW04=1 UP---RESERVED
SW03=1 UP---RESERVED
SW02=1 UP---RESERVED FOR OVERLAYS
SW01=1 UP---RESERVED FOR OVERLAYS
SW00=1 UP---RESERVED FOR OVERLAYS

5.2 OPERATING PROCEDURE FOR SINGLE PROCESSOR SINGLE BUS SYSTEMS

5.2.1 NORMAL OPERATION-ALL SWITCHES DOWN

WITH ALL SWITCHES DOWN, THE PROGRAM WILL INITIALIZE ALL SELECTED DEVICES AND THEN BEGIN EXECUTION OF PROCESSOR TEST CODE. AFTER ALL PROCESSOR AND IN-LINE DEVICE TEST CODE HAS BEEN RUN, THE PROGRAM WILL CHECK THE DEVICE WATCHDOGS TO VERIFY THAT SELECTED DEVICES HAVE INTERRUPTED AT LEAST ONCE DURING THE CURRENT PASS. THE PROGRAM WILL BEGIN EXECUTION OF THE MEMORY EXPANSION TEST (IF MORE THAN 8KW OF MEMORY IS AVAILABLE). AFTER THE MEMORY EXPANSION TEST IS COMPLETED, THE PROGRAM WILL TYPE AN ASTERISK AND RESTART THE PROCESSOR TEST.

IF AN ERROR OCCURS, THE PROGRAM WILL OUTPUT AN ERROR MESSAGE TO THE TELEPRINTER AND CONTINUE TESTING.

ON ALTERNATE PASSES, THE PROCESSOR 'T' BIT WILL BE SET CAUSING A TRACE TRAP TO OCCUR FOLLOWING THE EXECUTION OF EVERY PROCESSOR TEST INSTRUCTION.

IF THE PROCESSER UNDER TEST IS A PDP-11/45 THEN THE FOLLOWING SEQUENCE OF PASSES WILL BE EXECUTED:

PASS 0,14,ETC KERNEL MODE,R0-R5,NO 'T' TRAP
PASS 1,15,ETC KERNEL MODE,R0-R5,'T' TRAP
PASS 2,16,ETC KERNEL MODE,R10-R15,NO'T' TRAP
PASS 3,17,ETC KERNEL MODE,R10-R15,'T' TRAP
PASS 4,20,ETC SUPERVISOR MODE,R0-R5,NO 'T' TRAP
PASS 5,21,ETC SUPERVISOR MODE,R0-R5,'T' TRAP
PASS 6,22,ETC SUPERVISOR MODE,R10-R15,NO 'T' TRAP
PASS 7,23,ETC SUPERVISOR MODE,R10-R15,'T' TRAP
PASS 10,24,ETC USER MODE,R0-R5,NO 'T' TRAP
PASS 11,25,ETC USER MODE,R0-R5,'T' TRAP
PASS 12,26,ETC USER MODE,R10-R15,NO 'T' TRAP
PASS 13,27,ETC USER MODE,R10-R15,'T' TRAP

IF THE KT11 OPTION IS AVAILABLE AND NOT INHIBITED, ALL PASSES (EXCEPT 0 AND 1) ARE RUN WITH THE KT11 ENABLED (WITH VIRTUAL ADDRESSES MAPPED EQUAL TO PHYSICAL ADDRESSES).

NOTE: THE PASS COUNT CAN BE FOUND IN LOCATION "PASCNT". IF THE PROCESSOR IS A PDP-11/45, THE PASS COUNT WILL BE DISPLAYED IN THE PROCESSOR DISPLAY REGISTER.

5.2.1 NORMAL OPERATION CONTINUED

NOTE: IF A POWER FAILURE OCCURS, AN ERROR MESSAGE WILL BE TYPED IN THE STANDARD FORMAT AFTER POWER UP OCCURS. THE PROGRAM WILL THEN BEGIN EXECUTION OF PROCESSOR TEST AND WILL COMPLETE THE PROCESSOR TEST BEFORE RE-INITIALIZING SELECTED DEVICES. THIS DELAY IS NECESSARY TO ALLOW MECHANICAL DEVICES TO RECOVER FROM THE POWER FAILURE.

NOTE: THE PROCESSOR STACK POINTER WILL BE SET TO LOCATION "STACK" EACH TIME THAT THE PROCESSOR TEST IS STARTED. AT THE END OF EACH PASS, THE PROCESSOR STACK POINTER WILL BE SET TO LOCATION "STACKK". IF THE PROCESSOR (PDP-11/45) IS OPERATING IN OTHER THAN KERNEL MODE THE CURRENT MODE STACK POINTER WILL BE INITIALIZED TO "STACK" AND THE KERNEL STACK POINTER WILL BE SET TO "STACKK".

5.2.2 WITH SWITCH 15=1

THE PROGRAM WILL OPERATE AS DESCRIBED IN 5.2.1, EXCEPT THAT IF AN ERROR OCCURS, THE PROGRAM WILL HALT AFTER TYPEOUT.

NOTE: IF THIS OPTION IS USED, FURTHER ERRORS MAY OCCUR IF THE PROGRAM IS CONTINUED FROM THE HALT. THESE ERRORS MAY NOT BE DUE TO DEVICE FAILURES, BUT MAY BE CAUSED BY UNSATISFIED INTERRUPT AND NPR REQUESTS THAT WERE PENDING AT THE TIME OF THE HALT.

5.2.3 WITH SWITCH 15=1, AND SWITCH 6=1

THE PROGRAM WILL PERFORM AS DESCRIBED IN 5.2.2, EXCEPT THAT ALL DEVICES THAT HAVE BEEN SELECTED WILL BE RE-INITIALIZED, AND PROCESSOR TEST WILL BE RESTARTED.

5.2.4 WITH SWITCH 12=1

THE PROGRAM WILL PERFORM AS DESCRIBED IN 5.2.1, EXCEPT THAT THE CURRENT PROCESSOR MODE WILL BE FROZEN, I.E., IF THE 'T' BIT IS SET, IT WILL REMAIN SET, IF IT IS CLEARED, IT WILL STAY CLEARED, ETC.

NOTE: IF THE PROCESSOR IS A PDP-11/45, THE MODE IN PROGRESS AT THE TIME THAT SWITCH 12 IS SET TO 1 WILL BE CONTINUOUSLY EXECUTED.

5.2.5 WITH SWITCH 11=1

THE PROGRAM WILL PERFORM AS DESCRIBED IN 5.2.1, EXCEPT THAT EACH SUB-LOOP OF PROCESSOR TEST WILL BE EXECUTED ONLY ONCE PER PASS, AND THE DEVICE WATCHDOGS WILL NOT BE CHECKED.

5.2.6 WITH SWITCH 10=1

NO PROCESSOR TEST CODE WILL BE EXECUTED, AND NO END OF PASS INDICATION WILL BE GIVEN. ERROR MESSAGES WILL OCCUR IN THE NORMAL MANNER.

5.2.7 WITH SWITCH 9=1

THE PROGRAM WILL PERFORM AS DESCRIBED IN 5.2.1, EXCEPT THAT THE MEMORY EXPANSION TEST WILL NOT BE EXECUTED.

5.2.8 WITH SWITCH 8=1

THE PROGRAM WILL PERFORM AS DESCRIBED IN 5.2.1, EXCEPT THAT AT THE END OF A PASS, OR IF AN ERROR OCCURS THE PROGRAM WIL DELETE ONE OF THE DEVICES THAT HAS BEEN SELECTED FOR TESTING. ON EVERY SUBSEQUENT ENTRY INTO THE ROUTINE, THE PREVIOUSLY DELETED DEVICE WILL BE RESTORED, AND A NEW DEVICE WILL BE DELETED. THE PROGRAM WILL THEN RE-INTIALIZE ALL SELECTED DEVICES AND PROCESSOR TEST EXECUTION WILL BE RESTARTED.

5.2.9 WITH SWITCH 7=1

THE PROGRAM WILL PERFORM AS DESCRIBED IN 5.2.1, EXCEPT THAT ALL ERROR MESSAGES, AND THE END OF PASS ASTERISK WILL BE TRANSMITTED TO THE HIGH SPEED PUNCH INSTEAD OF THE TELETYPE.

5.2.10 WITH SWITCH 6=1

THE PROGRAM WILL PERFORM AS DESCRIBE IN 5.2.1, EXCEPT THAT IF AN ERROR OCCURS, ALL SELECTED DEVICES WILL BE RE-INITIALIZED, AND PROCESSOR TEST WILL BE RESTARTED.

5.3 OPERATING PROCEDURE FOR SYSTEMS WITH BUS SWITCH

5.3.1 NORMAL OPERPATION-ALL SWITCHES DOWN

THE PROGRAM WILL PERFORM AS DESCRIBED IN 5.2.1, EXCEPT THAT AT THE END OF EVERY PASS, THE BUS SWITCH WILL BE RELEASED BY THE PROCESSOR THAT IT IS CONNECTED TO AND THE OTHER PROCESSOR WILL ASSUME CONTROL.

5.3.2 SWITCH REGISTER OPTIONS

THE SWITCH REGISTER OPTIONS FUNCTION THE SAME AS FOR A SINGLE PROCESSOR WITH THE EXCEPTION THAT SW6=1(RESTART ON ERROR) WILL CAUSE THE BUS SWITCH TO BE DISCONNECTED, AND THE OTHER PROCESSOR WILL BE CONNECTED.

5.4 OPERATION WITH OVERLAY LOADED

5.4.1 BACKGROUND OVERLAY

IF A BACKGROUND OVERLAY HAS BEEN LOADED, THE PROGRAM WILL PERFORM AS DESCRIBED IN SECTION 5.2, EXCEPT THAT AT THE END OF EACH PASS (BEFORE THE ASTERISK), GTP WILL TRANSFER CONTROL TO THE OVERLAY. WHEN ALL OVERLAY CODE HAS BEEN EXECUTED, CONTROL WILL BE TRANSFERED BACK TO GTP, AND THE END OF PASS ASTERISK WILL BE TYPED.

5.4.2 FOREGROUND OVERLAY

PROGRAM OPERATION WILL BE AS DESCRIBED IN SECTION 5.2.

6. ERRORS

6.1 ERROR PRINTOUT

THE FORMAT FOR ALL ERROR PRINTOUTS IS SEVEN COLUMNS OF DATA THE SIGNIFICANCE OF EACH COLUMN IS DESCRIBED BELOW

COLUMN 1= PC+2 OF THE TEST THAT FAILED
COLUMN 2= PROCESSOR STATUS AT THE TIME OF FAILURE
COLUMN 3= PROCESSOR TEST IN PROGRESS AT THE TIME OF FAILURE
COLUMN 4= STACK OFFSET
COLUMN 5= FIRST DEVICE SELECTION (SR1) REGISTER
COLUMN 6= SECOND DEVICE SELECTION (SR2) REGISTER
COLUMN 7= THIRD DEVICE SELECTION (SR3) REGISTER

6.2 ERROR RECOVERY

FOR TTY READER AND HSR, TAPE MUST BE REPOSITIONED TO LEADER BEFORE RESTARTING TEST.

7. RESTRICTIONS

7.1 STARTING RESTRICTION

IF LINE PRINTER IS USED RESTART ADDRESS MUST BE 400 FOR HSR AND TTY READER, TAPE MUST BE ON LEADER. FOR MAGNETIC TAPE, UNIT ZERO MUST BE SELECTED. FOR DECTAPE, UNIT ONE MUST BE SELECTED.

7.2 OPERATIONAL RESTRICTION

IF THE TELEPRINTER (AND/OR TELETYPE PUNCH) IS BEING USED FOR ERROR MESSAGE OUTPUT, THE READER PUNCH COMBINATION CANNOT BE TESTED UNLESS THE INPUT TO THE READER IS A BINARY COUNT TAPE THAT IS INDEPENDENT OF THE PUNCH OUTPUT.

IF THE HIGH SPEED PUNCH IS BEING USED FOR ERROR MESSAGE OUTPUT, THE READER-PUNCH COMBINATION CANNOT BE TESTED UNLESS THE INPUT TO THE READER IS A BINARY COUNT TAPE THAT IS INDEPENDENT OF THE PUNCH OUTPUT.

IF ISOLATION BY DROPOUT IS TO BE USED, THE INPUT TO THE TELEPRINTER (HIGH SPEED) READER MUST BE INDEPENDENT OF THE OUTPUT FROM THE TELETYPE (HIGH SPEED) PUNCH SINCE THESE DEVICES ARE TREATED AS INDEPENDENT BY THE ISOLATION ROUTINE.

8. TROUBLESHOOTING USING GTP

8.1 TRACKING DOWN UNUSUAL FAILURES

IF A FAILURE OCCURS THAT IS NOT IMMEDIATLY OBVIOUS, THE FOLLOWING SET OF CHECKPOINTS IS PROVIDED AS AN AID TO TROUBLESHOOTING.

8.1.1 CAN THE FAILURE BE ISOLATED TO THE DEVICE THAT FAILS BY SELECTING ONLY THAT DEVICE.

8.1.2 IS THE PROBLEM

A) A DEVICE FAILURE
B) A UNIBUS NOISE PROBLEM
C) A SYSTEM CONFIGURATION PROBLEM

8.1.3 DOES THE FAILURE OCCUR IF PROCESSOR TEST IS INHIBITED

8.1.4 DOES THE FAILURE OCCUR IF PROCESSOR TEST IS ENABLED
BUT CORE EXPANSION IS INHIBITED

8.1.5 DOES THE FAILURE OCCUR CONSISTENTLY

8.1.6 DOES THE FAILURE OCCUR CONSISTENTLY IN ONE PROCESSOR SUBTEST

8.1.7 IS THE PROBLEM AN NPR LATENCY ERROR, IF SO
A) IS BUS POSITION CORRECT
B) IS A NO SACK TIMEOUT OCCURING

8.1.8 IS THE PROBLEM A BR LATENCY PROBLEM, IF SO
A) IS THE POSITION ON THE BUS CORRECT
B) ARE DEVICES AT THEIR STANDARD BR LEVEL, IF NOT
1) HAS GTP BEEN MODIFIED TO ACCOUNT FOR THIS FACT
2) THE DEVICES MAY HAVE TO BE RECONFIGURED TO STANDARD LEVELS FOR GTP TO RUN

8.1.9 IF THE PROGRAM COMES TO A HALT AT LOCATION 6, A BUS ERROR TIMEOUT HAS OCCURED. IF THIS HAPPENS
A) WHERE WAS THE PROGRAM WHEN THE TRAP OCCURED
B) WHICH DEVICE DID NOT RAISE SLAVE SYNC

8.1.10 IF THE PROGRAM COMES TO A HALT AT LOCATION 12, AN ILLEGAL INSTRUCTION TRAP HAS OCCURED. IF THIS HAPPENS
A) WAS THE PROGRAM MODIFIED
B) IS THE PROCESSOR KNOWN TO BE GOOD
C) ARE THE MEMORIES KNOWN TO BE GOOD

8.1.11 IF THE PROCESSOR IS HUNG
A) WHAT DEVICE, IF ANY, IS BUS MASTER
B) WHAT IS THE STATE OF THE C LINES
C) WHAT BRS AND NPRS ARE PENDING
D) WHAT GRANTS ARE PENDING
E) WHAT WAS THE PROCESSOR DOING WHEN THE HANG OCCURED
F) DID THE PROCESSOR, OR A DEVICE, CAUSE THE BUS TO HANG

8.1.12 IF A "NON-EXISTENT MEMORY" ERROR OCCURS FOR AN NPR DEVICE
A) WHAT IS THE ADDRESS (ALL 18 BITS) IN THE DEVICE BUS ADDRESS REGISTER
B) IS THE ADDRESS VALID
C) DOES THE OFFSET OF THE DEVICE BUS ADDRESS REGISTER FROM THE START OF THE MEMORY BUFFER AND THE COUNT IN DEVICE WORD COUNT REGISTER AGREE
D) IS THE DEVICE TIMEOUT TOO SHORT

8.1.13 ARE THERE MORE THAN 20 UNIT LOADS ON THE UNIBUS WITHOUT A BUS BUFFER

8.1.14 IS THERE MORE THAN 50 FEET OF UNIBUS CABLE

8.1.15 IS THE UNIBUS TERMINATED CORRECTLY

8.1.16 IF A POWER FAILURE OCCURES
A) IS ANY POWER SUPPLY OVERLOADED
B) WHAT IS THE LINE VOLTAGE
C) DOES THE SYSTEM RECOVER PROPERLY

8.1.17 IF A DEVICE FAILURE, OR PROCESSOR FAILURE OCCURS
A) DO ALL DEVICE AND PROCESSOR DIAGNOSTICS RUN WITHOUT ERROR
B) HAVE ALL DIAGNOSTICS BEEN RUN BEFORE GTP

8.1.18 IF THE SIZE OF THE SYSTEM IS REDUCED BY REMOVING DEVICES FROM THE BUS, OR SHORTENING THE LENGTH OF BUS CABLE
A) DOES THE DEVICE IN QUESTION STILL FAIL
B) DOES I1 FAIL THE SAME WAY
C) HOW SMALL DOES THE SYSTEM HAVE TO BE MADE BEFORE THE SYSTEM FUNCTIONS CORRECTLY

8.2 GTP TROUBLESHOOTING FEATURES

SECTION 8.1 GIVES A LIST OF HARDWARE CHECKPOINTS THAT CAN BE USED TO ISOLATE SYSTEM HARDWARE FAILURES. THIS SECTION DESCRIBES THE FEATURES IN GTP THAT CAN BE USED AS AN AID TO TROUBLE SHOOTING.

8.2.1 LOCATIONS OF INTEREST IN GTP

8.2.1.1 RETURN

THIS LOCATION CONTAINS THE STARTING ADDRESS OF THE PROCESSOR, OR IN-LINE DEVICE TEST CURRENTLY IN PROGRESS.

8.2.1.2 ICOUNT

THIS LOCATION CONTAINS THE NUMBER OF TIMES THAT THE CURRENT PROCESSOR, OR IN-LINE DEVICE TEST WILL BE EXECUTED

8.2.1.3 SCOPEF

THIS LOCATION CONTAINS THE NUMBER OF TIMES THAT A PARTICULAR SUBTEST HAS BEEN EXECUTED.

8.2.1.4 PASCNT

THIS LOCATION CONTAINS THE NUMBER OF PASSES THAT THE PROGRAM HAS EXECUTED

8.2.1.5 REGISTER 6

THIS REGISTER CONTAINS THE PROCESSOR STACK POINTER. WHEN ANY PROCESSOR TEST IS ENTERED, THIS REGISTER SHOULD CONTAIN THE VALUE "STACK"

8.3 MODIFYING GTP FOR TROUBLESHOOTING

8.3.1 IN ORDER TO OBTAIN TIGHTER LOOPS ON A PROCESSOR SUBTEST, CHANGE THE "SCOPE" INSTRUCTION AT THE END OF THE SUBTEST TO A BRANCH TO THE FIRST INSTRUCTION OF THAT SUBTEST.

8.3.2 IN ORDER TO DETERMINE THE CONTENTS OF A DEVICE STATUS REGISTER WHEN A FAILURE OCCURS, REPLACE THE CALL TO THE GTP ERROR ROUTINE, "HLT", WITH HALT (OP CODE 000000) THE CONTENTS OF THE DEVICE REGISTER MAY NOW BE EXAMINED.

8.3.3 THE CONTENTS OF UP TO THREE (3) DEVICE REGISTERS MAY BE TYPED BY THE GTP ERROR HANDLER, AFTER AN ERROR HAS OCCURED. THIS MAY BE ACCOMPLISHED BY CHANGING THE LITERAL(S) LOCATED AT PREG1+2(PREG2+2,PREG3+2) TO THE ADDRESS(ES) OF THE DEVICE REGISTER(S) TO BE TYPED(SEE LISTING). WHEN AN ERROR OCCURS, THE CONTENTS OF THE SELECTED DEVICE REGISTER(S) WILL BE TYPED IN COLUMN(S) 5(6,7) OF THE ERROR TYPEOUT, INSTEAD OF THE CONTENTS OF THE DEVICE SELECTION REGISTERS.

NOTE: IF THE CONTENTS OF A REGISTER IS TYPED AS DESCRIBED IN 8.3.3, CARE SHOULD BE TAKEN WHEN INTERPRETING THE CONTENTS SINCE THE ERROR ROUTINE WILL NOT READ THAT REGISTER UNTIL SEVERAL SECONDS AFTER THE ERROR HAS OCCURED.

9. WRITING OVERLAYS FOR GTP

GTP HAS THE FACILITY TO INTERFACE WITH A USER OVERLAY FOR TESTING ANY DEVICE NOT INCLUDED IN GTP.

THE OVERLAY MAY BE EITHER A NON-INTERRUPTING BACKGROUND TEST (SUCH AS A SPECIAL PROCESSOR TEST, OR A TEST OF A NON-INTERRUPTING DEVICE SUCH AS A KE11 EXTENDED ARITHMETIC UNIT) OR A TEST FOR AN INTERRUPT-DRIVEN DEVICE THAT IS TO BE RUN CONCURRENTLY WITH DEVICES ALREADY INCLUDED IN GTP.

NOTE: THE USER SHOULD REFERENCE THE LISTING OF GTP FOR EXAMPLES OF TEST CODE THAT IS COMPATIBLE WITH GTP.

9.1 OVERLAY LINKING

9.1.1 BACKGROUND OVERLAY

A BACKGROUND OVERLAY IS CALLED BY GTP USING THE "IOT" INSTRUCTION. THEREFORE, THE USER MUST TERMINATE HIS OVERLAY WITH AN "RTI" INSTRUCTION TO RETURN TO GTP.

LOCATION 000020 MUST BE SET UP BY THE OVERLAY AT PROGRAM LOAD TIME WITH THE POINTER TO THE FIRST EXECUTABLE INSTRUCTION IN THE OVERLAY.

9.1.2 OVERLAY INITIALIZATION (FOR EITHER BACKGROUND OR FOREGROUND OVERLAYS)

IF THE USER REQUIRES INPUTS TO HIS OVERLAY FROM EITHER THE PROCESSOR CONSOLE SWITCHES, OR THE TELETYPE HE MUST PROVIDE A ROUTINE TO PERFORM THIS FUNCTION.

THIS ROUTINE IS CALLED BY GTP WITH THE INSTRUCTION "JSR %7,@GETSW", AFTER THE DEVICE INHIBIT SWITCHES HAVE BEEN SET (SEE SECTION 4.3.4 FOR DETAILS OF SELECTION)

THE USER MUST SET UP LOCATION 001020 WITH A POINTER TO HIS OVERLAY INITIALIZATION ROUTINE AT OVERLAY LOAD TIME.

THE ROUTINE MUST BE TERMINATED WITH AN "RTS %7" TO RETURN CONTROL TO GTP AFTER OVERLAY INITIALIZATION HAS BEEN COMPLETED.

9.1.2 DEVICE PRIMING CODE

IF THE OVERLAY IS A TEST OF AN INTERRUPT DRIVEN DEVICE THAT IS TO RUN CONCURRENTLY WITH OTHER SELECTED DEVICES THE DEVICE MUST BE INITIALIZED, OR "PRIMED", IMMEDIATLY AFTER ALL OTHER SELECTED DEVICES HAVE BEEN "PRIMED" BY GTP.

THE USER PRIMING CODE IS CALLED BY GTP WITH "JSR %7,@PRIME" IMMEDIATLY AFTER ALL INTERNAL PRIMING CODE HAS BEEN EXECUTED.

THE OVERLAY MUST SET UP LOCATION 001022 WITH A POINTER TO THE USER PRIMING CODE AT OVERLAY LOAD TIME.

THE PRIMING CODE MUST BE TERMINATED WITH AN "RTS %7" TO RETURN CONTROL TO GTP.

9.2 SCOPE LOOPS

IT IS SUGGESTED THAT THE OVERLAY USE THE INTERNAL SCOPE AND ITERATION LOOP ROUTINE. THIS ROUTINE IS CALLED BY A "TRAP" INSTRUCTION.

9.3 ERRORS

IT IS SUGGESTED THAT THE OVERLAY USE THE ERROR HANDLER INTERNAL TO GTP FOR ERROR REPORTING, UNLESS DETAILED ERROR INFORMATION IS REQUIRED.

THIS ROUTINE IS CALLED BY AN "EMT" INSTRUCTION.

9.4 RESTRICTIONS

9.4.1 THE ONLY LOCATIONS AVAILABLE TO THE USER OVERLAY IN THE FIRST 8KW OF MEMORY (000000-037777) ARE

000020	LINK TO USER BACKGROUND OVERLAY
170-174	USER VECTORS
270-274	USER VECTORS
300-776	FLOATING DEVICE VECTORS
001020	LINK TO USER OVERLAY INITIALIZATION ROUTINE
001022	LINK TO USER DEVICE PRIMING CODE

9.4.2 THE FOLLOWING INSTRUCTIONS MUST NOT BE USED

RESET, WAIT, IOT, BR ., JMP ., 3 (TRACE TRAP)

9.4.3 LIMITED USE INSTRUCTIONS

HALT-MAY BE USED ONLY IN OVERLAY INITIALIZATION ROUTINE
EMT-MAY BE USED ONLY AS CALL TO GTP ERROR HANDLER
TRAP-MAY BE USED ONLY AS CALL TO GTP SCOPE LOOP AND ITERATION HANDLER

9.4.4 THE PROCESSOR STACK POINTER (R6) MUST NOT BE MODIFIED

9.4.5 IF THE GENERAL REGISTERS (R0-R5) ARE USED BY A DEVICE INTERRUPT SERVICE ROUTINE, THEIR CONTENTS MUST BE SAVED IMMEDIATLY UPON ENTRANCE TO THE ROUTINE AND RESTORED IMMEDIATLY BEFORE EXITING THE ROUTINE.

9.4.6 ALL DEVICE INTERRUPT SERVICE ROUTINES SHOULD BE SERVICED AT THE DEVICE HARDWARE INTERRUPT LEVEL.

9.4.7 ONLY BITS 0-3 AND 5-8 OF THE PROCESSOR STATUS WORD MAY BE MODIFIED, AND ONLY BY "BIS" AND "BIC" INSTRUCTIONS

9.4.8 THE OVERLAY MUST NOT CAUSE A TIMEOUT TRAP IN EITHER DEVICE PRIMING, INTERRUPT SERVICE, OR BACKGROUND TEST CODE.

9.4.9 SCOPE LOOPS ARE NOT PERMITTED IN INTERRUPT SERVICE ROUTINES

9.4.10 THE FIRST INSTRUCTION OF A BACKGROUND OVERLAY MUST NOT BE AN EMT (CALL TO GTP SCOPE LOOP ROUTINE).

10. MISCELLANIOUS

10.1 EXECUTION TIME

EXECUTION VARIES WITH NUMBER OF DEVICES, FOR 8KW SYSTEMS WITH TTY AND HSR ONLY, ABOUT 1 MINUTE WITH THE TRACE BIT CLEARED ABOUT 1.5 MINUTES WITH THE TRACE BIT SET. DEVICES SUCH AS THE AA11 DAC AND AD01-D A/D CONVERTER MAY LENGTHEN EXECUTION TIME TO OVER AN HOUR. (INTERRUPT MAY OCCUR AS OFTEN AS EVERY 30 MICROSECONDS.)

	PROCESSOR ONLY (2 ASTERISKS)	RF, RK AND TC11 (2 ASTERISKS)
8KW	2.5 MINUTES	3 MINUTES
12KW	5	6
16KW	7.5	9
20KW	10	12
24KW	12.5	15
28KW	20	22

NOTE: IF THE PROGRAM IS BEING RUN UNDER ACT11 AUTO ACCEPT, A SINGLE PASS OF ACT11 WILL EQUAL ONE CYCLE THRU THE PASS TABLE. FOR AN 11/45 THIS WILL BE 12 ASTERISKS, FOR AN 11/40 IT WILL BE 4 ASTERISKS, AND FOR AN 11/10 OR AN 11/20 IT WILL BE 2 ASTERISKS.

10.2 THE MEMORY LAYOUT IS BROKEN INTO FOUR DISTINCT PARTS:

(1) THE TRAP CATCHER,
(2) THE SET UP AND I/O PRIMER AREA AND I/O TEST ROUTINES,
(3) THE PROCESSOR TESTS AND
(4) CONTROL AND UTILITY ROUTINES.

11. PROGRAM DESCRIPTION

THE DESIGN OF THIS SYSTEM EXERCISER IS PREDICATED UPON IT BEING PRIMARILY INTENDED FOR A PAPER TAPE SYSTEM WITH EIGHT Kw OF MEMORY, AND THAT IT BE EASY TO RUN AND UNDERSTAND. ALSO, THAT IT MAY BE MODIFIED EASILY TO EXERCISE A WIDE MULTITUDE OF PERIPHERALS, INCLUDING THOSE OF THE CUSTOMER'S OWN DESIGN. THE CONCEPT IS TO HAVE ALL DESIRED I/O RUNNING CONCURRENTLY WITH THE PROCESSOR TEST FOR BACKGROUND. THE DECISION OF WHICH I/O DEVICES ARE TO BE USED IS MADE AT STARTUP TIME. THE DATA PATTERNS USED IN THE EXERCISER ARE FIXED. FOR MECHANICAL DEVICES, SUCH AS THE TTY READER, THERE IS NO AUTOMATIC RESYNCHRONIZATION. IF PAPER TAPE BECOMES OUT OF PHASE WITH THE DATA, STOP THE EXERCISER, RESYNC THE TAPE, AND THEN RESTART THE EXERCISER.

THERE IS NO MONITOR IN THE CONVENTIONAL SENSE. EACH DEVICE THAT IS TO BE EXERCISED HAS IT'S OWN STAND ALONE ROUTINE THAT OPERATES IN THE INTERRUPT MODE. THESE ROUTINES NEED NO SUPERVISION OR MONITORING AFTER THEY ARE INITIATED. THERE IS A PRIMER AREA THAT CHECKS THE SWITCH REGISTER TO SEE WHAT DEVICES ARE TO BE INITIATED. THE PRIMER AREA SETS THE INTERRUPT ENABLE BIT IN THE DEVICE STATUS REGISTER, INITIALIZES THE DATA PATTERN AND INITIATES AN OPERATION TO RAISE DATA FLAGS ON DEVICES THAT CAN NOT INITIATE THEM THEMSELVES. THEN, THE PRIMER JUMPS TO THE PROCESSOR TEST WHERE THE INDIVIDUAL DEVICES ARE SERVICED AT THE INTERRUPT RATE.

NOTE: SEE THE FIRST PAGE OF THE LISTING FOR A TABLE OF CONTENTS. IN THE LEFTMOST COLUMN OF THE TABLE OF CONTENTS IS THE LINE NUMBER AT WHICH THE PARTICULAR ROUTINE CAN BE FOUND. LISTING LINE NUMBERS ARE SEQUENTIAL AND ARE IN THE LEFTMOST COLUMN OF EACH PAGE.

(11. CONT'D)

THE INSTRUCTION EXERCISER IS A STRAIGHT LINE TEST OF INSTRUCTIONS. THE SEQUENCE IN WHICH THEY ARE EXECUTED IS THE SAME SEQUENCE IN WHICH THEY ARE SHOWN IN THE LISTING. EACH AREA OF CODE FROM "SCOPE TO SCOPE" IS AN INDIVIDUAL SUB-TEST. WITH SWITCH 11 UP THE SUB-TEST IS EXECUTED ONE TIME AND THEN THE NEXT SUB-TEST IS EXECUTED, AND SO ON TILL ALL SUBTESTS HAVE BEEN EXECUTED. HOWEVER IF SWITCH 11 IS DOWN THE SUB-TEST WILL BE EXECUTED SOME "N" NUMBER OF TIMES BEFORE ENTERING THE NEXT SUB-TEST. IF SWITCH 14 IS UP YOU WILL NEVER LEAVE THE CURRENT SUB-TEST YOU ARE IN. THIS USE IS INTENDED FOR TROUBLE SHOOTING A MALFUNCTION IN A SUB-TEST. THE FIRST GROUP OF SUB-TESTS ARE THE BINARYS AND UNARYS. THOSE INSTRUCTIONS ARE TESTED IN THE INDEX MODE: SOURCE ONLY, DESTINATION ONLY, THEN BOTH SOURCE AND DESTINATION. THE SAME INSTRUCTIONS ARE THEN TESTED USING THE IMMEDIATE MODE INDIRECT. THESE MODES ARE TESTED AGAINST OTHER MODES WHICH MAY USE A REGISTER OR MEMORY LOCATION. THESE WILL BE SWAPPED BETWEEN SOURCE AND DESTINATION.

AFTER THE MODES AND INSTRUCTION HAVE BEEN PROVEN IN THE WORD MODE, THEY ARE THEN TESTED IN THE BYTE MODE. OTHER TESTING IS ALSO DONE WHERE THE "JSR" INSTRUCTION IS TESTED IN NESTED COMBINATIONS. ALL COMBINATIONS OF NUMBERS ARE TESTED USING THE COMPARE, ROTATE, ADD AND COMPLIMENT INSTRUCTIONS. THERE IS ALSO A MINIMUM TEST OF POWER FAIL AND AUTO RECOVERY, WHICH IS NOT ENABLED UNTIL AFTER THE FIRST PASS OF THE PROGRAM. THE PROGRAM REQUIRES TWO ASTERISKS ON THE TTY TO MAKE ONE TRUE PASS OF THE PROGRAM. THE FIRST ASTERISK OCCURS AFTER ONE PASS OF THE INSTRUCTION TEST WITH THE TRACE BIT CLEARED. THE SECOND ASTERISK MARKS THE END OF AN INSTRUCTION TEST PASS WITH THE TRACE BIT SET. THE REASON FOR EXECUTING ALL INSTRUCTIONS WITH THE TRACE BIT SET IS TO TAKE US INTO SERVICE AT THE END OF EACH INSTRUCTION.

NOTE: THE KT11 OPTION IS NOT ENABLED UNTIL TWO PASSES HAVE BEEN COMPLETED (TWO ASTERISKS).

NOTE: IF THE PROCESSOR UNDER TEST IS A PDP-11/45 THEN A MINIMUM OF 12 PASSES WILL BE REQUIRED FOR COMPLETE TESTING OF THE PROCESSOR. (SEE SECTION 5.2.1 FOR DETAILS OF THE PROCESSOR MODES THAT WILL BE EXERCISED).

11.1. SUBROUTINE ABSTRACTS

11.1.1 BEGIN SA 200

11.1.2 SCOPE

THIS SUBROUTINE CALL IS PLACED BETWEEN EACH SUBTEST IN THE INSTRUCTION SECTION. IT RECORDS THE STARTING ADDRESS OF EACH SUB-TEST AS IT IS BEING ENTERED. IF A SCOPE LOOP IS REQUESTED, IT WILL JUMP TO THE START OF THE SUBTEST THAT THE SCOPE LOOP IS REQUESTED FOR. IF A SCOPE LOOP IS NOT REQUESTED, THERE WILL BE EITHER A FIXED OR RANDOM NUMBER OF ITERATIONS ON THAT SUB-TEST BEFORE THE NEXT SUBTEST IS ENTERED. SWITCH 11 ON A 1 INHIBITS ITERATION OF SUBTESTS. ALSO SWITCH 10 IS TESTED TO SEE IF A WAIT INSTRUCTION SHOULD BE EXECUTED IN PLACE OF THE PROCESSOR TEST.

11.1.3 PRINT

THIS ROUTINE HANDLES THE ERROR CALL HLT, TYPING OUT THE ERROR ARGUMENTS AS LISTED IN SECTION 6.1.

11.1.4 ENDPAS

THIS ROUTINE IS EXECUTED AT THE END OF A PROGRAM PASS, AFTER THE END OF PASS ASTERISK IS PRINTED.

THIS ROUTINE PERFORMES THE FOLLOWING THREE FUNCTIONS:

A) TYPE AN ERROR MESSAGE INDICATING THAT A PASS HAS BEEN COMPLETED AND THAT NO ERRORS OCCURED DURING THE CURRENT PASS. CONTROL WILL THEN BE TRANSFERED TO THE ISOLATION ROUTINE (ISOLAT) AND THE PROGRAM WILL BE RESTARTED.

B) THE ROUTINE WILL SET THE PROCESSOR STATUS WORD TO THE NEXT MODE IN SEQUENCE, OR FREEZE IT IN THE CURRENT MODE, DEPENDING UPON WHETHER SW12=0 OR 1.

C) IF THE PROGRAM IS RUNNING IN MULTI-PROCESSOR MODE THE ROUTINE WILL RELEASE THE BUS SWITCH, AND THEN, AFTER A DELAY TO ALLOW THE OTHER PROCESSOR TO CONNECT THE SWITCH WILL BE REQUESTED, AND THE PROGRAM WILL BE RESTARTED WHEN THE SWITCH CONNECTS.

11.1.5 TRAPCATCHER

THIS IS A SERIES OF INSTRUCTIONS STARTING AT LOCATION 0, DESIGNED TO DETECT AND ISOLATE UNEXPECTED TRAPS AND INTERRUPTS TO THE TRAP AND INTERRUPT VECTOR AREA OF MEMORY.

THE PRINCIPAL OF THIS ROUTINE IS: THE VECTOR ENTRANCE ADDRESS POINTS TO THE NEXT SEQUENTIAL WORD WHICH CONTAINS A HALT (00000). (THIS LOCATION IS ALSO THE STATUS FOR THAT VECTOR ENTRANCE, BUT THIS HAS NO EFFECT ON IT ALSO BEING THE NEXT INSTRUCTION).

IF A HALT OCCURS IN THE TRAP OR INTERRUPT VECTOR AREA, REGISTER SIX SHOULD BE EXAMINED TO DETERMINE ITS CONTENTS, THEN USE REGISTER SIX CONTENTS AS AN ADDRESS TO DETERMINE THE LOCATION WHERE THE PROGRAM WAS WHEN THE INTERRUPT OR TRAP OCCURRED. (MEMORY AS SPECIFIED BY R6 CONTAINS THE PC OF THE INSTRUCTION FOLLOWING THE INSTRUCTION WHERE THE TRAP OCCURRED).

11.1.7 WATCH (DEVICE WATCHDOGS)

THIS ROUTINE DETERMINES, AFTER ALL OF THE PROCESSOR TEST HAS BEEN EXECUTED, WHETHER ALL INTERRUPT DRIVEN DEVICES THAT HAVE BEEN SELECTED INTERRUPTED AT LEAST ONCE DURING THE CURRENT PASS. IF A DEVICE DOES NOT INTERRUPT ON A GIVEN PASS, THE INTERRUPT OCCURED FLAG FOR THAT DEVICE IS NOT SET AND AN ERROR MESSAGE WILL BE TYPED INDICATING WHICH DEVICE IS FAILING.

11.1.8 ISOLAT

THIS ROUTINE WILL DELETE, SEQUENTIALLY, ONE OF THE DEVICES THAT HAS BEEN SELECTED FOR TESTING, AFTER THE INITIAL OCCURENCE OF ANY ERROR. EACH TIME ANOTHER ERROR OCCURS, OR AT THE END OF EVERY PASS IF NO ERROR OCCURS THAT PASS, THE PREVIOUSLY DELETED DEVICE WILL BE RESTORED TO OPERATION, AND THE NEXT SELECTED DEVICE WILL BE DELETED. THE PROGRAM WILL THEN REINITIALIZE ALL THOSE DEVICES THAT HAVE BEEN SELECTED FOR TESTING AND THE PROCESSOR TEST WILL BE RESTARTED.

11.1.9 TTYIN1 (TTY INPUT)

THIS ROUTINE OPERATES IN THE INTERRUPT MODE AND CHECKS FOR A COUNT PATTERN IN THE READER OF THE TTY. THE ROUTINE WILL ACCEPT AN INFINITE NUMBER OF ZERO BYTES (BLANK TAPE). BUT THE FIRST BYTE THAT IS NOT A ZERO MUST BE A ONE AND ALL SEQUENTIAL BYTES MUST BE ONE GREATER.

11.1.10 TYOUT (TTY OUTPUT)

THIS IS A ROUTINE THAT OUTPUTS A COUNT PATTERN IN THE INTERRUPT MODE TO THE TELEPRINTER.

11.1.11 RF11 (RF-11 DISK)

THIS ROUTINE PERFORMS A WRITE AND A WRITE CHECK OF THE DISK. THE DATA THAT IS WRITTEN ON THE DISK IS PART OF TEST PROGRAM CODE THAT IS NEVER MODIFIED. THIS SEGMENT OF MEMORY IS WRITTEN IN CONTIGUOUS BLOCK THRU THE DISK MEMORY. AFTER THE TOTAL DISK(S) HAS BEEN WRITTEN, A WRITE CHECK IS USED TO VERIFY THAT THE DATA HAS BEEN WRITTEN CORRECTLY ON THE DISK. NOTE THAT NO "DATO" ARE USED IN EXERCISING THE DISK (DATA IS NOT TRANSFERRED INTO MEMORY). THERE IS A LOCATION IN THE PROGRAM THAT IF MODIFIED WILL ALLOW EXERCISING UP TO EIGHT DISKS.

11.1.12 TC11 (TC11 DECTAPE)

TC11 IS THE FIRST ADDRESS IN THE DECTAPE INTERRUPT VECTOR (214). THIS ROUTINE WILL READ, IN REVERSE, BLOCK NUMBERS UNTIL THE REVERSE END ZONE IS FOUND. AT THIS POINT THE INTERRUPT VECTOR AND COMMAND REGISTER ARE MODIFIED TO READ ALL BLOCK NUMBERS IN THE FORWARD DIRECTION. EACH BLOCK NUMBER READ IS COMPARED WITH THE EXPECTED BLOCK NUMBER COUNT AND MISCOMPARISONS REPORTED. WHEN EACH BLOCK IS FOUND (WITH THE EXCEPTION OF BLOCK 0) A BLOCK (400 WORDS) OF TEST DATA IS WRITTEN ONTO TAPE. AFTER ALL BLOCK NUMBERS HAVE BEEN READ THE TAPE IS DRIVEN INTO THE FORWARD END ZONE. HERE THE DIRECTION IS REVERSED AND ALL BLOCK NUMBERS ARE READ IN REVERSE. STARTING WITH BLOCK 1100 THROUGH BLOCK 1 THE DATA IS READ FROM TAPE. THE SAME BUFFER IS USED FOR BOTH READ AND WRITE OPERATIONS. THE DATA IN THE BUFFER IS CHECKSUMMED WHILE IN THE PROCESSOR TEST "SCOPE" ROUTINE. IF THE DATA-BUFFER IS DESTROYED DURING A READ OPERATION IT MAY BE NECESSARY TO RELOAD THE PROGRAM.

NOTE: TC11 DRIVE 1 IS USED BY THIS TEST.

11.1.13 KW11L (LINE CLOCK)

THIS TEST OF THE LINE CLOCK IS IN THE INTERRUPT MODE. THE CLOCK INTERRUPTS AT LINE FREQUENCY IF AN INTERRUPT OCCURS DURING A PASS, THE INTERRUPT OCCURED FLAG IS SET FOR THE LINE CLOCK. IF THE LINE CLOCK FAILS TO INTERRUPT SUBSEQUENTLY, THE FAILURE WILL NOT BE DETECTED UNTIL THE NEXT PASS, WHEN THE INTERRUPT OCCURED FLAGS ARE CHECKED AGAIN.

11.1.14 LPINTR (LINE PRINTER)

THIS ROUTINE OUTPUTS TO THE LINE PRINTER IN THE FLAG MODE WHILE FILLING THE BUFFER IN THE INTERRUPT MODE WHILE THE BUFFER IS BEING PRINTED.

11.1.15 HSRIN1 (PC11 INPUT)

THIS ROUTINE OPERATES IN THE INTERRUPT MODE AND CHECKS FOR A COUNT PATTERN IN THE PC11 READER. THE ROUTINE WILL ACCEPT AN INFINITE NUMBER OF ZERO BYTES (BLANK TAPE). BUT THE FIRST BYTE THAT IS NOT A ZERO MUST BE A ONE AND ALL SEQUENTIAL BYTES MUST BE ONE GREATER. IF THE ROUTINE DETECTS AN ERROR IN THE COUNT PATTERN, A DATA ERROR IS FLAGED.

11.1.16 HPOUT (PC11 OUTPUT)

THIS IS A ROUTINE THAT OUTPUTS A COUNT PATTERN IN THE INTERRUPT MODE TO THE HIGH SPEED PUNCH.

11.1.17 AD01D (AD01-D A/D CONVERTER)

THIS INTERRUPT MODE ROUTINE DOES A WAS-IS TEST ON CHANNELS ZERO THRU THREE. ONE CONVERSION FOR EACH CHANNEL IS LOADED INTO A TABLE, AND THEN A SECOND CONVERSION FOR EACH IS LOADED INTO ANOTHER TABLE. THE TWO TABLES ARE THEN COMPARED TO MAKE SURE THAT THE TWO CONVERSIONS FOR EACH CHANNEL ARE WITHIN + OR -1 LSB OF EACH OTHER. AFTER THE INITIAL LOOP THRU THE ROUTINE, THE TWO TABLES ARE LOADED ALTERNATELY. TABLE A IS LOADED AND COMPARED TO TABLE B, THEN TABLE B IS LOADED AND COMPARED WITH TABLE A, AND SO ON. THE CONVERSIONS ARE DONE AT A GAIN OF X8, AND THUS EACH CHANNEL (0-3) MUST HAVE A CONSTANT DC VOLTAGE ON IT LESS THAN 1.25 VOLTS.

11.1.18 AFC11 (AFC11 LOW LEVEL MULTIPLEXER)

THIS INTERRUPT MODE ROUTINE DOES A WAS-IS TEST ON CHANNELS ZERO THRU SEVEN. AN AVERAGE OF EIGHT CONVERSIONS FOR EACH CHANNEL IS LOADED INTO A TABLE, AND THEN A SECOND SET OF AVERAGES IS TAKEN AND LOADED INTO A SECOND TABLE. THE TWO TABLES ARE COMPARED TO MAKE SURE THAT THE DIFFERENCE IN AVERAGES FOR EACH CHANNEL IS NOT GREATER THAN + OR -20 LSB. AFTER THE INITIAL TABLE OF AVERAGES IS TAKEN, THE SECOND TABLE REPLACES THE FIRST WHEN COMPARSION HAS BEEN COMPLETED. THE CONVERSIONS ARE DONE AT A GAIN OF 1000, AND THUS EACH CHANNEL MUST HAVE A CONSTANT DC VOLTAGE OF LESS THAN 5 MV AS AN INPUT.

11.1.19 CRINT (CR11/CM11 40 AND 80 COLUMN CARD READER)

THIS INTERRUPT DRIVEN ROUTINE CHECKSUMS EACH CARD READ IN BOTH CARD-IMAGE AND ENCODED FORMS. ALL CARDS IN THE ALPHANUMERIC DECK HAVE THE SAME CHECKSUMS (ONE FOR CARD-IMAGE, ONE FOR ENCODED). THE TEST FAILS IF THE SUMS TAKEN ON A CARD FAIL TO MATCH THOSE FOR THE ALPHANUMERIC DECK. WHEN THE CARD READER GOES OFF-LINE, THE ROUTINE CLEARS THE INTERRUPT CAUSED BY THAT AND RETURNS TO THE MAIN PROGRAM. WHEN THE CARD READER IS PUT BACK ON-LINE, THE CORRESPONDING INTERRUPT IS CLEARED AND CHECKSUMING IS RESUMED.

11.1.20 TM11 (MAGNETIC TAPE)

THIS IS THE FIRST TAG OF THE MAGTAPE ROUTINE, HERE THE CONTROL IS GIVEN AN INITIAL COMMAND TO REWIND TAPE. WHEN BOT IS REACHED WE COMMENCE TO WRITE A RECORD 22 BYTES LONG. UPON COMPLETION OF THE WRITE, THE TAPE IS BACKSPACED ONE RECORD, AND WE THEN READ THE PREVIOUSLY WRITTEN RECORD. UPON COMPLETION OF THE READ THE TAPE READ BUFFER IS TESTED TO SEE IF IT CONTAINS ALL 52525, IF NOT AN ERROR IS REPORTED, WHEN FINISHED CHECKING THE BUFFER THE READ BUFFER IS FLUSHED TO ZEROS AND THE NEXT RECORD IS WRITTEN. THE SEQUENCE IS CONTINUED UNTIL .EOT IS DETECTED IN THE READ ROUTINE. THEN THE PROGRAM BRANCHES TO THE ORIGINAL ENTRANCE AND THE TAPE THEN REWINDS TO BOT AND THE SEQUENCE REPEATS ITSELF.

11.1.21 RC11 (RC11 DISK) (SEE 11.1.11)

11.1.22 RK11 (RK-11 DISK)

THIS ROUTINE PERFORMS A WRITE AND A WRITE CHECK OF THE DISK. THE DATA THAT IS WRITTEN ON THE DISK IS PART OF TEST PROGRAM CODE THAT IS NEVER MODIFIED. THIS SEGMENT OF MEMORY IS WRITTEN IN CONTIGUOUS BLOCK THRU THE DISK MEMORY. AFTER THE TOTAL DISK(S) HAS BEEN WRITTEN, A WRITE CHECK IS USED TO VERIFY THAT THE DATA HAS BEEN WRITTEN CORRECTLY ON THE DISK. NOTE THAT NO "DATO" ARE USED IN EXERCISING THE DISK (DATA IS NOT TRANSFERRED INTO MEMORY). THERE IS A LOCATION IN THE PROGRAM THAT IF MODIFIED WILL ALLOW EXERCISING UP TO FOUR DISKS.

11.1.23 DC11T1 (DC11 ASYNCHRONOUS LINE UNIT TRANSMITTER ROUTINE)

THIS ROUTINE OUTPUTS A COUNT PATTERN IN THE INTERRUPT MODE. THE OUTPUT IS COUPLED BY SPECIAL INTERNAL HARDWARE TO THE RECEIVER WHERE THE SERIAL DATA IS REASSEMBLED. THE RECEIVER SECTION OF THE HARDWARE WILL INTERRUPT THE PROCESSOR EACH TIME A WORD IS REASSEMBLED. THE RECEIVED DATA IS COMPARED TO THE TRANSMITTED DATA BY SOFTWARE.

11.1.24 DC11T2 (2ND DC11 TRANSMITTER ROUTINE)

THIS ROUTINE IS IDENTICAL TO THE DCOUT ROUTINE EXCEPT THAT IT ALLOWS FOR A SECOND DC11 TO BE TESTED WITH THE SYSTEM.

11.1.25 AA11 (AA11 DAC WITH SCOPE OPTION)

THIS ROUTINE DISPLAYS THE MESSAGE "PDP-11" ON ANY OF THE CRT OPTIONS OF THE AA11. THIS MESSAGE IS POINT PLOTTED USING A 5 BY 7 MATRIX TWO DAC'S ARE USED ONE FOR THE Y AXIS, ONE FOR THE X AXIS. THIS ROUTINE IS INTERRUPT DRIVEN AND FLICKER MAY BE OBSERVED IF OTHER DEVICES ARE BEING TESTED AT THE SAME TIME.

11.1.26 DP11T (DP11 SYNCHRONOUS LINE UNIT)

THIS ROUTINE USES PROCESSOR TEST CODE AS AN OUTPUT BUFFER, FOR TRANSMISSION IN THE INTERRUPT MODE. THE OUTPUT IS COUPLED BY SPECIAL INTERNAL HARDWARE TO THE RECEIVER WHERE THE DATA IS REASSEMBLED. BOTH THE TRANSMITTER AND RECEIVER ARE DOUBLE BUFFERED. THE BYTE BEING TRANSMITTED AND THE BYTE BEING RECEIVED MAY BE THREE CHARACTERS APART. THE RECEIVED COMPARED TO A PREDICTED VALUE BY SOFTWARE. THE DP11 USES A SYNC CHARACTER OF 26(8).

11.1.27 DM11T (DM11 ASYNCHRONOUS MULTIPLEXER)

THE DM11 ROUTINE TRANSMITS A BINARY COUNT PATTERN ON ALL 16 DM11 LINES (UNLESS PATCHED OTHERWISE), AND RECEIVES DATA ON ALL ACTIVE LINES (IF JUMPERS ARE INSERTED, OTHERWISE DATA IS RECEIVED ON LINE 0 ONLY). RECEIVED DATA IS CHECKED ON LINE 0 ONLY. THE PROGRAM IS SET FOR THE DM11 TO INTERRUPT TO LOCATION 340 (RECEIVER) AND 344 (TRANSMITTER) AND SERVICES INTERRUPTS AT LEVEL5. RECEIVED DATA IS CHECKED AT 8 BITS PER CHARACTER BUT MAY BE PATCHED OTHERWISE. LINE 0 HAS A SPECIAL INTERNAL HARDWARE MAINTENANCE LOOP.

NOTE: THE MAINTENANCE CARD MUST BE INSTALLED TO RUN THIS TEST

11.1.28 ABS DUMP ROUTINE

THE ABS DUMP ROUTINE WAS INCLUDED TO ALLOW THE CREATION OF TAILORED VERSIONS OF GIP FOR SOME OF THE FOLLOWING REASONS:

1. PRESET SWITCH REGISTER SET UP TO ALLOW STARTING AT 200 WITH ALL SWITCHES DOWN.

2. VECTORS FOR RELATIVE DEVICES SUCH AS DP11,DM11, ETC. MAY NEED TO BE CHANGED FOR CERTAIN CONFIGURATIONS.

3. ROUTINES OF USER ORIGIN MAY BE MERGED WITH THE EXISTING CODE.

4. LP11 ROUTINE MODIFIED FOR 132 COLUMNS

5. KL11 ROUTINE MODIFIED FOR THE VT05,VT06, OR LC11.

11.1.29 DR11B (DR11B GENERAL PURPOSE NPR INTERFACE)

THERE ARE TWO SEPERATE WAYS THIS OPTION MAY BE TESTED. IN MAINTENANCE MODE AND AS A INTER-PROCESSOR BUFFER.

MAINTENANCE MODE REQUIRES THAT THE MAINTENANCE MODULE BE IN SLOT C04, D04. UNDER THESE CONDITIONS A TEST IS PERFORMED ON THE "NPR", AND THE DIRECTION CONTROL LOGIC (C LINES). THIS TEST IS IN LINE AS A PROCESSOR TEST AND PERFORMS MULTIPLE "NPR" TRANSFERS WHEN ENCOUNTERED. IN THIS MODE THE FIRST WORD OF THE BUFFER IS TRANSFERED INTO THE SECOND WORD, THE THIRD WORD INTO THE FOURTH WORD. THIS SEQUENCE CONTINUES UNTIL WORD COUNT OVERFLOWS. NOTE: THE DR11B IN MAINTENANCE MODE WHEN DOING "NPR" BECOMES BUS MASTER FOR FOUR (4) NPRS.

TO BE USED AS AN INTER-PROCESSER BUFFER REQUIRES TWO COMPUTERS, EACH HAVING ITS OWN DR11B WITH A SPECIAL CABLE CONNECTING THE DR11B TOGETHER. THE PROGRAM MUST BE LOADED INTO EACH COMPUTER, BLOCK TRANSFER OF DATA IS MADE IN EACH DIRECTION CONTROLED BY AN INTERRUPT DRIVEN ROUTINE. WHILE DOING THESE TRANSFERS THE DR11B GIVES UP THE BUS MASTER SHIP AFTER EACH "NPR" TRANSFER.

11.1.30 EXPAND (MEMORY EXPANSION)

THIS MEMORY EXPANSION IS ACCOMPLISHED BY REPEATING A UNIQUE TEST IN UNUSED MEMORY. IN THE STRAIGHT LINE CODE A TEST IS MADE TO SEE IF EXTRA MEMORY IS TO BE USED. IF SO THE MEMORY IS FILLED WITH THE UNIQUE TEST, THEN THE PROCESSOR TEST JUMPS TO THE START OF THE EXPANDED CODE. THIS CODE IS EXECUTED IN THESE MEMORIES UNTIL THE END OF THE CODE IS REACHED, THEN IT WILL RETURN TO THE NORMAL PROCESSOR TEST. IN EXPANDED MEMORY EACH COPY OF THE UNIQUE TEST IS ITERATED 4000(8) TIMES BEFORE THE NEXT COPY IS EXECUTED.

THE AMOUNT OF MEMORY IS DETERMINED BY DOING A TST (0)+ UNTIL A TIME OUT TRAP OCCURS. THE VALUE IN THE REGISTER AT THIS TIME IS CONSIDERED TO BE HIGH MEMORY. 1000(8) BYTES ARE SUBTRACTED FROM THIS VALUE TO LEAVE A BUFFER AT THE TOP OF MEMORY.

A COPY OF THE ROTATE BYTE INSTRUCTION TEST IS USED AS THE UNIQUE TEST TO FILL MEMORY. THIS TEST IS WRITTEN IN POSITION INDEPENDENT CODE.

11.1.31 CD11 (NPR CARD READER)

THIS ROUTINE READS AND CHECKSUMS 1 CARD AT A TIME IN BOTH ALPHA AND IMAGE MODES. EXCEPT FOR THE FACT THAT AN ENTIRE CARD IS READ VIA NPRS, AND THE DATA STORED IN A TEMPORARY BUFFER, THE OPERATION OF THE ROUTINE IS SIMILAR TO 11.1.19.

11.1.32 DN11 (DN11 DIGITAL DIALER)

THIS ROUTINE IS AN IN-LINE DEVICE TEST AND IS RUN AFTER ALL PROCESSOR TEST CODE (EXCEPT MEORY EXPANSION) IS COMPLETED. THE DN11 IS OPERATED IN MAINTENANCE MODE, AND AN INTERRUPT OCCURS EACH TIME A MAINTENANCE FUNCTION IS SET. THE TEST IS REPEATED 4000 TIMES(OCTAL).

11.1.33 UDC11 (UNIVERSAL DIGITAL CONTROLLER)

THIS ROUTINE IS AN IN-LINE DEVICE TEST AND IS RUN AFTER ALL PROCESSOR TEST CODE (EXCEPT MEMORY EXPANSION) IS COMPLETED. THE UDC11 IS OPERATED IN MAINTENANCE MODE. INTERRUPTS ARE GENERATED IN IMMEDIATE AND DEFERED SCAN MODES BY SETTING THE MAINTENANCE BIT. THE TEST IS REPEATED 4000 (OCTAL) TIMES EACH PASS.

11.1.34 DRACT (DR11A,C GENERAL INTERFACE)

THIS ROUTINE IS AN IN-LINE DEVICE TEST AND IS RUN AFTER ALL PROCESSOR TEST CODE (EXCEPT MEMORY EXPANSION) IS COMPLETED. THE DEVICE IS RUN IN MAINTENANCE MODE, AND THE TEST CONSISTS OF 2 PARTS, A DTAT TEST, AND AN INTERRUPT TEST. THIS TEST IS REPEATED 4000 TIMES (OCTAL) EACH PASS.

11.1.35 KGSTRT (KG11 CYCLIC REDUNDANY CHECK OPTION)

THIS ROUTINE IS AN IN-LINE DEVICE TEST AND IS RUN AFTER
ALL PROCESSOR TEST CODE (EXCEPT MEMORY EXPANSION) IS COMPLETED.
THE KG11 IS A NON-INTERRUPTING DEVICE, AND THE TEST
CODE IS SIMILAR TO PROCESSOR TEST.
THREE FUNCTIONS OF THE KG11 ARE TESTED ,CRC12, CRC16, AND CCITT.
EACH FUNCTION IS TESTED BY TRANSMITTING KNOWN DATA TO
THE KG11, AND COMPARING THE RESULTS OF THE HARDWARE OPERATION
WITH A TABLE F KNOWN RESULTS. THE TEST IS REPEATED
4000(OCTAL) TIMES EACH PASS.

11.1.36 DM11-BB (MODEM CONTROL MULTIPLEXER)

THIS ROUTINE IS AN IN-LINE DEVICE TEST AND IS RUN AFTER
ALL PROCESSOR TEST CODE (EXCEPT MEMORY EXPANSION) IS COMPLETED.
THE DM11-BB IS OPERATED IN MAINTENANCE MODE WITH INTERRUPTS
ENABLED AND THE LINE SCANNER RUNNING. THE SCANNER
MEMORY IS INITIALLY CLEARED TO 0, AND DETECTION OF
THE MAINTENANCE MODE INPUTS TO THE SCANNER WILL
CAUSE AN INTERRUPT ON EACH LINE.

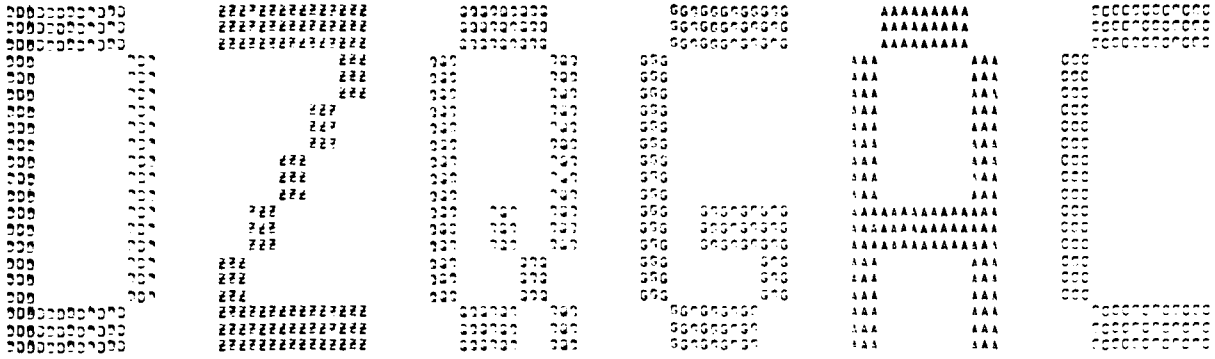
11.1.37 M792YA (PAPER TAPE BOOTSTRAP LOADER)

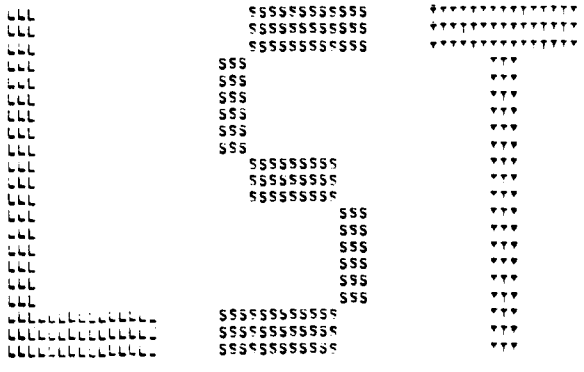
THIS IS AN INLINE DEVICE TEST. THE CONTENTS OF THE
M792YA READ ONLY MEMORY ARE ADDED TO FORM
A CHECKSUM. THE RESULT IS COMPARED WITH A KNOWN VALUE.
IF THE CHECKSUMS ARE DIFFERENT, AN ERROR IS REPORTED.
THE TEST IS REPEATED 4000(OCTAL) TIMES.

11.1.38 M792YB (BULK BOOTSTRAP LOADER)

THIS IS AN INLINE DEVICE TEST. IT IS A COMBINED TEST
FOR THE M792YB AND MR11-DB BULK STORAGE
DEVICE BOOTSTRAP LOADERS, WHICH BOTH HAVE
THE SAME ADDRESS ON THE I/O PAGE.
AN ATTEMP IS MADE TO DETERMINE WHICH OF THE
TWO DEVICES IS INSTALLED IN THE SYSTEM. IF NEITHER
DEVICE IS RECOGNIZED, AND NO TIME-OUT TRAP OCCURS, AN
ERROR IS REPORTED. IF THE DEVICE IS RECOGNIZED, A CHECKSUM
OF THE DEVICE'S READ ONLY MEMORY IS COMPUTED, AND COMPARED
WITH A KNOWN VALUE FOR THAT DEVICE. IF THE CHECKSUMS
DIFFER, AN ERROR IS REPORTED. THE TEST IS RUN 4000(OCTAL)
TIMES.

12. LISTING





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LP%SPL Version 4(137)  Running on LPT1
 egTARTe Jeer 3_5   [402,3221] Job  DEGGAC Seq. 113 Date 24-Oct-73 2213*137 weather 576A 4112 518+598 RRA72A eSTARTe noteiR_C
Request created: 24-Oct-73  20124122
File: DSK:DEGGAC.L5TE472,30211 Created: 24-Oct-73 20122132 Printed: 24-Oct-73 2213?151
QUEUE Switches: /PRINT:ARROW /FILE:ASCII /COPIES:1 /SPACING:1 /LIMIT:149?
File will be deleted after printing
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,MAIN,  MACY11,694  24-OCT-73  22122
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```

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```
                        ;THIS PROGRAM IS A MULTI-DEVICE EXERCISER
                        ;THIS PROGRAM IS NOT INTENDED AS EITHER
                        ;A COMPLETE TEST OF THE PROCESSOR, OR AS A DETAILED
                        ;DIAGNOSTIC FOR ANY DEVICES THAT HAVE BEEN SELECTED
                        ;THIS PROGRAM REQUIRES A MINIMUM OF 8KW OF MEMORY FOR OPERATION
                        ;COPYRIGHT 1970, 1971, 1972, 1973, DIGITAL EQUIPMENT CORP., MAYNARD MASS, 01754



                        ;FOR NORMAL OPERATION RUN WITH ALL SWITCHES DOWN
                        ;SR15=1 UP---HALT ON ERROR
                        ;SR14=1 UP---SCOPE LOOP - PROCESSOR TEST
                        ;SR13=1 UP---INHIBIT PRINT OUT
                        ;SR12=1 UP---FREEZE PROCESSOR IN CURRENT MODE
                        ;SR11=1 UP---INHIBIT SUB-PROGRAM ITERATION(WATCHDOGS ARE NOT CHECKED)
                        ;SR10=1 UP---INHIBIT PROCESSOR TEST
                        ;SR09=1 UP---INHIBIT MEMORY EXPANSION
                        ;SR08=1 UP---ISOLATION--RY OPOPOUT
                        ;SR07=1 UP---SWITCH ERROR MESSAGES TO HIGH SPEED PUNCH
                        ;                (USE ONLY IF HIGH SPEED PUNCH TESTING IS INHIBITED)
                        ;SR06=1 UP---RESTART PROGRAM ON ERROR

                        ;IF THE PROCESSER UNDER TEST IS AN 11/45, SR12=0 ENABLES THE FOLLOWING:

                        ;               PASS 0,14,ETC   KERNEL MODE,R0-R5,NO 'T' TRAP
                        ;               PASS 1,15,ETC   KERNEL MODE,R0-R5,'T' TRAP
                        ;               PASS 2,16,ETC   KERNEL MODE,R10-R15,NO'T' TRAP
                        ;               PASS 3,17,ETC   KERNEL MODE,R10-R15,'T' TRAP
                        ;               PASS 4,20,ETC   SUPERVISOR MODE,R0-R5,NO 'T' TRAP
                        ;               PASS 5,21,ETC   SUPERVISOR MODE,R0-R5,'T' TRAP
                        ;               PASS 6,22,ETC   SUPERVISOR MODE,R10-R15,NO 'T' TRAP
                        ;               PASS 7,23,ETC   SUPERVISOR MODE,R10-R15,'T' TRAP
                        ;               PASS 10,24,ETC  USER MODE,R0-R5,NO 'T' TRAP
                        ;               PASS 11,25,ETC  USER MODE,R0-R5,'T' TRAP
                        ;               PASS 12,26,ETC  USER MODE,R10-R15,NO 'T' TRAP
                        ;               PASS 13,27,ETC  USER MODE,R10-R15,'T' TRAP

                        ;IF THE KT11 IS PRESENT, ALL PASSES EXCEPT 0 AND 1 ARE RUN WITH
                        ;THE KT11 ON IF NOT INHIBITED. (SW05 MUST BE DOWN IN THE 3RD
                        ;DEVICE INHIBIT SETTING TO ALLOW USE OF THE KT11)


                        ;NOTE!  THE PASS COUNT IS GIVEN IN OCTAL AND IS DISPLAYED IN THE
                        ;DISPLAY REGISTER (PDP-11/45 ONLY).

                        ;IF THE PROCESSOR UNDER TEST IS A PDP-11/40, SR12=0 ENABLES THE FOLLOWING:

                        ;               PASS 0,4,ETC    KERNEL MODE, NO 'T' TRAP
                        ;               PASS 1,5,ETC    KERNEL MODE, 'T' TRAP
                        ;               PASS 2,6,ETC    USER MODE, NO 'T' TRAP
                        ;               PASS 3,7,ETC    USER MODE, 'T' TRAP

                        ;IF THE KT11 IS PRESENT, ALL PASSES EXCEPT 0 AND 1 ARE RUN WITH THE
```



```
                        ;KT11 ON IF NOT INHIBITED.

                        ;SPECIAL DELETE SWITCHES-SET RESPECTIVE SWITCH TO A 1
                        ;TO INHIBIT INITIALIZATION OF DEVICE

                        ;NOTE!  IF A NON-EXISTENT DEVICE IS SELECTED IN ANY OF THE
                        ;THREE DEVICE INHIBIT SETTINGS, A BUS ERROR TRAP WILL OCCUR AND
                        ;THE PROGRAM WILL HALT AT LOCATION 6

                        ;AFTER STARTING ADDRESS HAS BEEN LOADED
                        ;SW00=1 INHIBIT DT11 BUS SWITCH SELECTION
                        ;SW01=1 INHIBIT MULTI-PROCESSOR TESTING
                        ;SW02=1 INHIBIT PC11 HSP
                        ;SW03=1 INHIBIT PC11 HSR
                        ;SW04=1 INHIBIT KW11-L LINE CLOCK
                        ;SW05=1 INHIBIT CR11 CARD READER
                        ;SW06=1 INHIBIT KW11-P PROGRAMMABLE REAL TIME CLOCK
                        ;SW07=1 INHIBIT LP11 LINE PRINTER --- IF LINE PRINTER IS USED, MUST RESTART AT 600
                        ;SW08=1 INHIBIT SECTION ONE AND TWO OF THE BUS TESTER (FACTORY USE ONLY)
                        ;SW09=1 INHIBIT SECTION THREE AND FOUR OF THE BUS TESTER (FACTORY USE ONLY)
                        ;SW10=1 INHIBIT RF11 DISK
                        ;SW11=1 INHIBIT UDC11
                        ;SW12=1 INHIBIT RC11 DISK
                        ;SW13=1 INHIBIT TC11 DECTAPE
                        ;SW14=1 INHIBIT KL11 TTY OUTPUT
                        ;SW15=1 INHIBIT KL11 TTY INPUT

                        ;NOTE!  IF ALL SWITCHES ARE DOWN FOR THIS FIRST DEVICE INHIBIT
                        ;SETTING, THE PREVIOUSLY CHOSEN DEVICES WILL BE TESTED

                        ;AFTER FIRST HALT
                        ;SW00=1 INHIBIT DC11 #1 ,,,, VECTOR 300
                        ;SW01=1 INHIBIT DC11 #2 ,,,, VECTOR 310
                        ;SW02=1 INHIBIT AA11 DAC WITH SCOPE OPTION
                        ;SW03=1 INHIBIT AFC11 ANALOG MULTIPLEXER
                        ;SW04=1 INHIBIT RK11 DISK
                        ;SW05=1 INHIBIT DR11-B GENERAL INTERFACE (NPR)
                        ;SW06=1 INHIBIT KE11-A (PDP-11/20) EXTENDED ARITHMETIC ELEMENT
                        ;SW07=1 INHIBIT AD01-D A/D CONVERTER
                        ;SW08=1 INHIBIT RP11 DISK
                        ;SW09=1 INHIBIT RESERVED (FOR BUS LATENCY TESTER)
                        ;SW10=1 INHIBIT DN11 DIGITAL DIALER
                        ;SW11=1 INHIBIT TM11 MAGNETIC TAPE
                        ;SW12=1 INHIBIT M792VA (DIODE BOOT FOR PC11,KL11)
                        ;SW13=1 INHIBIT M792VB (RF, RC, RK AND TC11) BOOT
                        ;                OR MR11-DB BULK BOOTSTRAP LOADER
                        ;SW14=1 INHIBIT DP11 SYNCHRONOUS LINE UNIT --- VECTOR 324
                        ;SW15=1 INHIBIT DM11 ASYNCHRONOUS MULTIPLEXER --- VECTOR 330

                        ;AFTER SECOND HALT
                        ;SW00=1 INHIBIT KG11-A REDUNDANCY CHECK OPTION
                        ;SW01=1 INHIBIT CD11 CARD READER
                        ;SW02=1 INHIBIT DR11-A, DR11-C GENERAL INTERFACE (INTERRUPT ONLY)
                        ;SW03=1 INHIBIT DM11-BB MODEM CONTROL MULTIPLEXER
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                        ;SW04=1 INHIBIT VR20 2 COLOR SCOPE OPTION
                        ;SW05=1 INHIBIT KT11 MEMORY MANAGEMENT OPTION
                        ;SW06=1 INHIBIT RESERVED
                        ;SW07=1 INHIBIT RESERVED
                        ;SW08=1 INHIBIT RESERVED
                        ;SW09=1 INHIBIT RESERVED
                        ;SW10=1 INHIBIT RESERVED
                        ;SW11=1 INHIBIT RESERVED
                        ;SW12=1 INHIBIT RESERVED
                        ;SW13=1 INHIBIT RESERVED
                        ;SW14=1 INHIBIT RESERVED
                        ;SW15=1 INHIBIT RESERVED

                        ;AFTER HALT SET SWITCHES FOR NORMAL RUNNING (ALL DOWN) CONTINUE

                        ;THE FORMAT FOR ALL ERROR PRINTOUTS IS SEVEN COLUMNS OF DATA
                        ;THE SIGNIFICANCE OF EACH COLUMN IS DESCRIBED BELOW

                        ;COLUMN 1= PC+2 OF THE TEST THAT FAILED
                        ;COLUMN 2= PROCESSOR STATUS AT THE TIME OF FAILURE
                        ;COLUMN 3= PROCESSOR TEST IN PROGRESS AT THE TIME OF FAILURE
                        ;COLUMN 4= STACK OFFSET
                        ;COLUMN 5= FIRST DEVICE SELECTION (SR1) REGISTER
                        ;COLUMN 6= SECOND DEVICE SELECTION (SR2) REGISTER
                        ;COLUMN 7= THIRD DEVICE SELECTION (SR3) REGISTER

                        ;NOTE: IF A POWER FAILURE OCCURS, AN ERROR MESSAGE WILL BE
                        ;TYPED IN THE STANDARD FORMAT AFTER POWER UP OCCURES.
                        ;THE PROGRAM WILL THEN BEGIN EXECUTION OF PROCESSOR TEST
                        ;AND WILL COMPLETE THE PROCESSOR TEST BEFORE RE-INITIALIZING
                        ;SELECTED DEVICES,  THIS DELAY IS NECESSARY TO
                        ;ALLOW MECHANICAL DEVICES TO RECOVER FROM THE POWER FAILURE.

                        ;NOTE: THE PROCESSOR STACK POINTER WILL BE SET TO LOCATION
                        ;"STACK" EACH TIME THAT THE PROCESSOR TEST IS STARTED.
                        ;AT THE END OF EACH PASS, THE PROCESOR STACK POINTER WILL
                        ;BE SET TO LOCATION "STACKK",  IF THE PROCESSOR
                        ;(PDP-11/45) IS OPERATING IN OTHER THAN KERNEL MODE
                        ;THE CURRENT MODE STACK POINTER WILL BE INITIALIZED TO "STACK"
                        ;AND THE KERNEL STACK POINTER WILL BE SET TO "STACKK".

                        ;NOTE: CORE EXPANSION MAY BE RUN WITH A GTP OVERLAY, IF THAT
                        ;OVERLAY DOES NOT REQUIRE MORE THAN 4K OF CORE.

                        ;NOTE:  THE PROGRAM IS INITIALIZED WITH A SPECIFIC DEVICE
                        ;       REGISTER AND VECTOR ADDRESS ASSIGNMENT FOR FLOATING
                        ;       VECTOR DEVICES,  TO ACCOMODATE OTHER CONFIGURATIONS,
                        ;       APPROPRIATE CHANGES SHOULD BE MADE IN THE "DEVICE
                        ;       REGISTER AND VECTOR TABLE".

                        ;NOTE:  THE FOLLOWING OPTIONS WILL BE TESTED UNCONDITIONALLY IF AVAILABLE

                        ;PDP-11/40 EIS
                        ;PDP-11/40 FIS
```



```
                        ;PDP-11/45 FPP

                        ;NOTE:  DECTAPE UNIT 1 IS NOW SELECTED FOR TEST BY THIS PROGRAM.
                        ;       TO SELECT A DIFFERENT DRIVE, PUT THE DRIVE SELECTION CODE
                        ;       IN BITS 8-10 OF LOCATION "CORV"

                        ;NOTE:  THE INPUTS OF AFC11 CHANNELS TO BE TESTED
                        ;       MUST EACH BE CONNECTED TO A VOLTAGE SOURCE NOT GREATER
                        ;       THAN +OR- 5 MILLIVOLTS
```

```
                                .SBTTL  DEFINITIONS
                                ;REGISTER DEFINITIONS

000000                          R0=%0
000001                          R1=%1
000002                          R2=%2
000003                          R3=%3
000004                          R4=%4
000005                          R5=%5
000006                          SP=%6                   ;PROCESSOR STACK POINTER
000007                          PC=%7                   ;PROGRAM COUNTER
000000                  FPS=    %0
000000                  AC0=    %0
000001                  AC1=    %1
000002                  AC2=    %2
000003                  AC3=    %3
000004                  AC4=    %4
000005                  AC5=    %5

                                ;LOCATION DEFINITIONS

177776                          PS=177776               ;PROCESSOR STATUS WORD
177772                          PIRQ=177772             ;PROGRAM INTERRUPT REQUEST REGISTER
177570                          SR=177570               ;CONSOLE SWITCH REGISTER
177570                          LIGHTS=177570           ;POP-11/45 DISPLAY REGISTER

                                ;INSTRUCTION DEFINITIONS

006401                          MARK1=6401              ;MARK INSTRUCTION
104400                          SCOPE=TRAP              ;CALL TO SCOPE LOOP AND ITERATION HANDLER
075000                          FADD=75000              ;11/40 FIS FLOATING ADD
075010                          FSUB=75010              ;   "  "      "     SUBTRACT
075020                          FMUL=75020              ;   "  "      "     MULTIPLY
075030                          FDIV=75030              ;   "  "      "     DIVIDE
                                .EQUIV  EMT,HLT
075010                          FSUB=75010              ;11/40 FIS FLOATING SUBTRACT
075020                          FMUL=75020              ;11/40 FIS FLOATING MULTIPLY
075030                          FDIV=75030              ;11/40 FIS FLOATING DIVIDE


                                ;SYMBOL DEFINITIONS

140000                          UM=140000


000000                  .=0
```



```
                                .SBTTL  TRAPCATCHER
                                ;.+2,HALT IS LOADED INTO EACH VECTOR ADDRESS/STATUS ADDRESS PAIR FROM
                                ;000 THRU 476

                                .SBTTL  VECTORS
                                ;PRESET VECTORS FOR INTERRUPT AND TRAP SERVICE

000014                          .=14
000014  034010                          TRTRET          ;TRACE TRAP RETURN
000016  000140                          140             ;SERVICE AT LEVEL 3
000020  001032          IO%VEC: DMVRTI          ;CALL TO USER BACKGROUND OVERLAY
000022  000000          IO%LVL: 0               ;SERVICE AT LEVEL 0

000024                          .=24
000024  035514                          PFAIL           ;POWER FAILURE HANDLER
000026  000340                          340             ;SERVICE AT LEVEL 7
000030  034352                          PRINT           ;TRAP FOR ERROR HANDLER
000032  000340                          340             ;PRINT AT LEVEL 7 (DROPS TO 4 IN ROUTINE)
000034  035116                          SCOPEC          ;TRAP FOR LOOPING
000036  000000                          0               ;LOOP SERVICE AT LEVEL 0

000060                          .=60
000060  004456          TTKIVI: TTYINR          ;TELETYPE READER
000062  000200                          200             ;SERVICE AT LEVEL 4
000064  004526          TTPIVI: TYOUTR          ;TELEPRINTER
000066  000200                          200             ;SERVICE AT LEVEL 4
000070  004552          HSRIVI: HSRINR          ;HIGH SPEED READER
000072  000200                          200             ;SERVICE AT LEVEL 4
000074  004622          HSPIVI: HPOUTR          ;HIGH SPEED PUNCH
000076  000200                          200             ;SERVICE AT LEVEL 4
000100  010352          KLIVI:  KW11L           ;KW11-L LINE CLOCK
000102  000300                          300             ;SERVICE AT LEVEL 6
000104  010214          KWIVI:  KW11P           ;KW11-P
000106  000300                          300             ;SERVICE AT LEVEL 6

000124                          .=124
000124  031160          DRBIVI: DRIR            ;DR11-B GENERAL NPR INTERFACE
000126  000240                          240             ;SERVICE AT LEVEL 5
000130  006304          AD01IVI: AD01D          ;AD01-D A-D CONVERTER
000132  000240                          240             ;SERVICE AT LEVEL 5
000134  005670          AFCIVI: AFC11           ;AFC11 ANALOG MULTIPLEXER
000136  000240                          240             ;SERVICE AT LEVEL 5
000140  006566          AA11IVI: AA11           ;AA11-A,B,C DIGITAL TO ANALOG
                                                ;CONVERTER WITH DISPLAY
000142  000200                          200             ;SERVICE AT LEVEL 4

000204                          .=204
000204  007420          RFIVI:  RF11            ;RF11 DISK
000206  000240                          240             ;SERVICE AT LEVEL 5
000210  007314          RCIVI:  RC11            ;RC11 DISK
000212  000240                          240             ;SERVICE AT LEVEL 5
000214  012164          TCIVI:  TC11            ;TC11 DECTAPE
000216  000300                          300             ;SERVICE AT LEVEL 6
000220  007074          RKIVI:  RK11            ;RK11 DISK
```

```
  275  000222  000240                    240             ;SERVICE AT LEVEL 5
  276  000224  007546                MTIVI   TM11            ;MTII MAGNETIC TAPE
  277  000226  000240                    240             ;SERVICE AT LEVEL 5
  278  000230  004714                CRDRIVI CRDM11          ;CARD READER (CR11/CM11 OR CD11)
  279  000232  000300                CRDRPS: 300             ;SERVICE AT LEVEL 6 (CR11/CM11) OR 4(CD11)
  280  000234  031026                UDIVI   UDINT           ;UDC11 UNIVERSAL DIGITAL CONTROLLER
  281  000236  000300                UDPS:   300             ;SERVICE AT LEVEL 6
  282
  283           000240                .=240
  284  000240  000000                PIRVEC: 0               ;SOFTWARE INTERRUPT
  285  000242  000000                PIRLVL: 7               ;SERVICE AT SELECTED LEVEL
  286           000250                .=250
  287  000250  000252                SEGVEC: 252
  288  000252  000000                SEGLVL: 0
  289  000254  007210                RPIVI   RP11            ;RP11 DISK PACK
  290  000256  000240                    240             ;SERVICE AT LEVEL 5
  291
  292           000300                .=300
  293  000300  010654                DC1RIVI DC11R1          ;DC11 #1 RECEIVE
  294  000302  000300                    300             ;SERVICE AT LEVEL 6
  295  000304  010622                DC1TIVI DC11T1          ;DC11 #1 TRANSMIT
  296  000306  000300                    300             ;SERVICE AT LEVEL 6
  297  000310  011002                DC2RIVI DC11R2          ;DC11 #2 RECEIVE
  298  000312  000300                    300             ;SERVICE AT LEVEL 6
  299  000314  010750                DC2TIVI DC11T2          ;DC11 #2 TRANSMIT
  300  000316  000300                    300             ;SERVICE AT LEVEL 6
  301
  302           000510                .=510
  303  000510  013750                    BUST1           ;BUS TESTER SECTION 1
  304  000512  000300                    300             ;SERVICE AT LEVEL 6
  305  000514  014002                    BUST2           ;BUS TESTER SECTION 2
  306  000516  000340                    340             ;SERVICE AT LEVEL 7
  307  000520  014144                    BUST3           ;BUS TESTER SECTION 3
  308  000522  000240                    240             ;SERVICE AT LEVEL 5
  309  000524  014316                    BUST4           ;BUS TESTER SECTION 4
  310  000526  000200                    200             ;SERVICE AT LEVEL 4
  311
  312                                   ;LOAD STARTING ADDRESSES
  313           000200                .=200
  314  000200  000167  001336                JMP     BEGIN1
  315           000400                .=400
  316  000400  000167  001136                JMP     BEGIN1
  317           000600                .=600
  318  000600  000167  000736                JMP     BEGIN1
  319           000610                .=.+4
```



```
  320                                   .SBTTL  ABSOLUTE CORE DUMP
  321                                   ;       INSTRUCTIONS FOR USE:
  322                                   ;
  323                                   ;       1,      START THE ROUTINE AT 610.
  324                                   ;       2,      THE DUMP ROUTINE WILL NOW HALT.  ENTER THE ADDRESS OF THE
  325                                   ;               DESIRED OUTPUT DEVICE INTO THE SWITCH REGISTER AND
  326                                   ;               PRESS CONTINUE.
  327                                   ;       3,      THE DUMP ROUTINE WILL HALT AGAIN.  NOW ENTER THE FIRST WORD
  328                                   ;               ADDRESS OF THE DATA AREA TO BE DUMPED AND PRESS CONTINUE.
  329                                   ;       4,      THE ROUTINE WILL HALT A THIRD TIME.  FINALLY ENTER THE LAST
  330                                   ;               WORD ADDRESS OF THE DATA AREA TO BE DUMPED AND
  331                                   ;               PRESS CONTINUE.  DUMPING WILL NOW PROCEED IN ABSOLUTE
  332                                   ;               FORMAT ON THE SELECTED DEVICE.
  333                                   ;       5,      WHEN DUMPING IS COMPLETE THE ROUTINE WILL HALT.
  334                                   ;               IF FURTHER DUMPING IS DESIRED PROCEED TO STEP #3.  IT IS
  335                                   ;               NOT NECESSARY TO RE-SPECIFY THE DEVICE ADDRESS.
  336                                   ;       6,      TO PUNCH STOP CODE WHEN DUMP HAS BEEN
  337                                   ;               COMPLETED, SET BIT 0 OF SWITCH REGISTER=1 AND
  338                                   ;               PRESS CONTINUE.  THE DUMP ROUTINE WILL HALT.
  339                                   ;               SET SWITCH REGISTER BIT 0=0 AND
  340                                   ;               PRESS CONTINUE.  THE DUMP ROUTINE WILL HALT.
  341                                   ;               PRESS CONTINUE.  THE DUMP ROUTINE WILL PUNCH A STOP CODE
  342                                   ;               AND THEN HALT.  THE PAPER TAPE PUNCH MAY NOW BE UNLOADED.
  343                                   ;
  344  000610  010706                    MOV     PC,SP           ;SET UP STACK
  345  000612  005746                    TST     -(SP)           ;ADDRESS
  346  000614  000000                    HALT                    ;ENTER DEVICE ADDRESS
  347  000616  013700  177570            MOV     @#SR,R0
  348  000622  010067  000134            MOV     R0,E,TCSR       ;SET UP PS ADDRESS
  349  000626  005200                    INC     R0
  350  000630  005200                    INC     R0              ;GENERATE DATA ADDRESS
  351  000632  010067  000132            MOV     R0,E,TDB        ;SET UP DATA ADDRESS
  352  000636  000000                E,0:    HALT                    ;ENTER START LOCATION TO R0
  353  000640  012703  000700            MOV     #E',PUN,R3
  354  000644  013700  177570            MOV     @#SR,R0         ;START LOCATION TO R0
  355  000650  000000                    HALT                    ;ENTER ENDING LOCATION INTO SR
  356  000652  013701  177570            MOV     @#SR,R1         ;ENDING LOCATION TO R1
  357  000656  012702  000010            MOV     #10,R2          ;10 NUL FRAMES TO PUNCH
  358  000662  005005                    CLR     R5              ;R5=CHECKSUM
  359  000664  005004                    CLR     R4              ;R4=CONTAINS FRAME TO PUNCH
  360  000666  005702                E,1:    TST     R2              ;ALL DONE?
  361  000670  003403                    BLE     E,2             ;JUMP IF YES
  362  000672  004713                    JSR     PC,(R3)         ;PUNCH ONE NULL FRAME
  363  000674  005302                    DEC     R2              ;DECREMENT FRAME COUNT
  364  000676  000773                    BR      E,1
  365  000700  005204                E,2:    INC     R4              ;SET R4=1
  366  000702  004713                    JSR     PC,(R3)         ;PUNCH A START FRAME
  367  000704  005004                    CLR     R4              ;R4=0
  368  000706  004713                    JSR     PC,(R3)         ;PUNCH A ZERO FRAME
  369  000710  010104                    MOV     R1,R4           ;SAVE LWA
  370  000712  160004                    SUB     R0,R4           ;LWA-FWA
  371  000714  062704  000007            ADD     #7,R4           ;CORRECT COUNT
  372  000720  004713                    JSR     PC,(R3)         ;PUNCH LOWER ORDER OF COUNT
  373  000722  000324                    SWAB    R4              ;GET UPPER BYTE
```

```
  374  000724  004713                        JSR     PC,(R3)         ;AND PUNCH IT
  375  000726  010004                        MOV     R0,R4           ;GET LOAD ADDRESS
  376  000730  004713                        JSR     PC,(R3)         ;AND PUNCH ITS LOWER ORDER
  377  000732  000304                        SWAB    R4              ;GET UPPER ORDER
  378  000734  004713                        JSR     PC,(R3)         ;AND PUNCH IT
  379  000736  020001              E,31      CMP     R0,R1           ;DONE PUNCHING DATA?
  380  000740  003003                        BGT     E,4             ;BRANCH IF YES
  381  000742  112004                        MOVB    (R0)+,R4        ;GET A DATA BYTE
  382  000744  004713                        JSR     PC,(R3)         ;AND PUNCH IT
  383  000746  000773                        BR      E,3
  384  000750  005405              E,41      NEG     R5              ;NEGATE CHECKSUM
  385  000752  010504                        MOV     R5,R4
  386  000754  004713                        JSR     PC,(R3)         ;PUNCH CHECKSUM
  387  000756  000727                        BR      E,0             ;AND GO BACK TO BEGINNING
  388                                       ;
  389  000760  105737  000000      E,PUN1    TSTB    @#,.            ;WAIT
  390          000762                      E,TCSR  .       ,-2
  391  000764  100375                        BPL     E,PUN           ;READY
  392  000766  110437  000000              E,TDB   MOVB    R4,@#,.         ;PUNCH A FRAME
  393          000770                              .       ,-2
  394  000772  060405                        ADD     R4,R5           ;ACCUMULATE CHECKSUM
  395  000774  000207                        RTS     PC
```



```
  396
  397                                       .SBTTL  DEVICE DRIVER OVERLAY LINKAGES
  398          001020                               .=1020
  399
  400  001020  001034              GETSW:  DMYRTS                  ;SET UP BY USER FOR SWITCH REGISTER INPUTS
  401  001022  001034              PRIME:  DMYRTS                  ;SET UP BY USER FOR DEVICE PRIMING
  402  001024  000000                      0
  403  001026  000000              OVFLAG: 0                       ;OVERLAY TO GTP COMMUNICATION WORD
  404  001030  000000              LINKER: 0                       ;OVERLAY LINKING POINTER
  405  001032  000002              DMYRTI: RTI                     ;DUMMY RETURN FROM BACKGROUND OVERLAY
  406  001034  000207              DMYRTS: RTS     PC              ;DUMMY RETURN FROM USER CODE
  407
  408                                       .SBTTL  GTP VARIABLES
  409
  410  001036  004000              ICOUNT: 4000                    ;NUMBER OF ITERATIONS OF SUBTEST
  411                                                              ;TO BE EXECUTED
  412  001040  000000              PRFLAG: 0                       ;ERROR HANDLER IN USE FLAG
  413  001042  000000              PASCNT: 0                       ;NUMBER OF PROGRAM PASSES
  414  001044  177777              SR1:    -1                      ;FIRST DEVICE SELECTION REGISTER
  415  001046  177777              SR2:    -1                      ;SECOND DEVICE SELECTION REGISTER
  416  001050  177777              SR3:    -1                      ;THIRD DEVICE SELECTION REGISTER
  417  001052  040000              LOCORE: 40000
  418  001054  000000                      0
  419  001056  000000              HICORE: 0                       ;UPPER LIMIT FOR CORE EXPANSION
  420  001060  000000              SCOPEF: 0                       ;NUMBER OF ITERATIONS OF SUBTEST COMPLETED
  421  001062  000000              CONFIG: 0                       ;PROCESSOR CONFIGURATION
  422  001064  014606              RETURN: PROCTS                  ;CONTAINS ADDRESS OF LAST TEST COMPLETED
  423  001066  000000              ACTFLG: 0                       ;IF NOT 0, PROGRAM UNDER EXTERNAL MONITOR CONTROL
  424          001067                      QVFLG=ACTFLG+1          ;IF NOT 0, PROGRAM RUNS IN QUICK VERIFY MODE
  425
  426                                       .SBTTL  DEVICE REGISTER AND VECTOR TABLE
  427          001100                               .=1100
  428                                       ;KL11
  429
  430  001100  177560              TRCSR:  177560                  ;TELETYPE READER CONTROL STATUS REGISTER
  431  001102  177562              TRDR:   177562                  ;TELETYPE READER DATA BUFFER
  432  001104  177564              TTCSR:  177564                  ;TELEPRINTER CONTROL STATUS REGISTER
  433  001106  177566              TTDBR:  177566                  ;TELEPRINTER DATA BUFFER
  434
  435                                       ;PC11
  436
  437  001110  177550              HRCSR:  177550                  ;HIGH SPEED READ STATUS REGISTER
  438  001112  177552              HRDBR:  177552                  ;HIGH SPEED READER DATA BUFFER
  439  001114  177554              HPCSR:  177554                  ;HIGH SPEED PUNCH CONTROL STATUS REGISTER
  440  001116  177556              HPDBR:  177556                  ;HIGH SPEED PUNCH DATA BUFFER
  441
  442                                       ;KW11-L
  443
  444  001120  177546              LKCSR:  177546                  ;KW11-L LINE CLOCK CONTROL STATUS REGISTER
  445
  446                                       ;LP11
  447
  448  001122  177514              LPCSR:  177514                  ;LP11 LINE PRINTER CONTROL STATUS REGISTER
  449  001124  177516              LPDBR:  177516                  ;LP11 LINE PRINTER DATA BUFFER
```

```
450
451                                     ;DR11-A,C
452
453  001126  167770                     DRACCS: 167770          ;DR11-A,DR11-C CONTROL STATUS REGISTER
454  001130  167772                     DRACOB: 167772          ;DR11-C,DR11-C OUTPUT BUFFER
455  001132  167774                     DRACIB: 167774          ;DR11-A,DR11-C INPUT BUFFER
456  001134  000000                     DRIVEC: 0               ;DR11-A,C INPUT INTERRUPT VECTOR
457  001136  000000                     DRILVL: 0               ;DR11-A,C INPUT INTERRUPT SERVICE LEVEL
458  001140  000000                     DROVEC: 0               ;DR11-A,C OUTPUT INTERRUPT VECTOR
459  001142  000000                     DROLVL: 0               ;DR11-A,C OUTPUT INTERRUPT SERVICE LEVEL
460
461                                     ;RF11
462
463  001144  177470                     RFDAE:  177470          ;RF11 DISK ADDRESS AND ERROR
464  001146  177472                     RFDBR:  177472          ;RF11 DATA BUFFER
465  001150  177466                     RFDAR:  177466          ;RF11 DISK ADDRESS REGISTER
466  001152  177462                     RFWC:   177462          ;RF11 WORD COUNT REGISTER
467  001154  177464                     RFCAR:  177464          ;RF11 CURRENT ADDRESS REGISTER
468  001156  177460                     RFCSR:  177460          ;RF11 CONTROL STATUS REGISTER
469  001160  177461                     RFCSRH: 177461          ;HIGH BYTE ADDRESS OF CSR
470
471                                     ;RC11
472
473  001162  177440                     RCLAI:  177440          ;RC11 LOOK AHEAD REGISTER
474  001164  177456                     RCDBR:  177456          ;RC11 DATA BUFFER
475  001166  177442                     RCDAR:  177442          ;RC11 DISK ADDRESS REGISTER
476  001170  177450                     RCWC:   177450          ;RC11 WORD COUNT REGISTER
477  001172  177452                     RCBAR:  177452          ;RC11 CURRENT ADDRESS REGISTER
478  001174  177446                     RCCSR:  177446          ;RC11 CONTROL STATUS REGISTER
479  001176  177447                     RCCSRH: 177447          ;HIGH BYTE ADDRESS OF CSR
480
481                                     ;DT11
482
483  001200  177420                     DTCSR:  177420          ;BUS SWITCH CONTROL STATUS REGISTER
484
485                                     ;RK11
486
487  001202  177416                     RKDBR:  177416          ;RK11 DATA BUFFER
488  001204  177412                     RKDAR:  177412          ;RK11 DISK ADDRESS REGISTER
489  001206  177413                     RKDAH:  177413          ;RK11 HIGH BYTE OF DISK ADDRESS
490  001210  177406                     RKWC:   177406          ;RK11 WORD COUNT REGISTER
491  001212  177410                     RKBAR:  177410          ;RK11 CURRENT ADDRESS REGISTER
492  001214  177404                     RKCSR:  177404          ;RK11 STATUS REGISTER
493  001216  177405                     RKCSRH: 177405          ;RK11 HIGH BYTE ADDRESS OF CSR
494  001220  177400                     RKDSR:  177400          ;RK11 DRIVE STATUS REGISTER
495  001222  000000                     RKDRV:  0               ;RK11 DRIVE SELECTED FOR TEST
496
497                                     ;KE11
498
499  001224  177304                     MQ:     177304          ;KE11 MULTIPLIER-QUOTIENT REGISTER
500  001226  177302                     AC:     177302          ;KE11 ACCUMULATOR
501  001230  177310                     SC:     177310          ;KE11 STEP COUNTER
502  001232  177311                     SRE:    177311          ;KE11 STATUS REGISTER
503  001234  177306                     MUL:    177306          ;KE11 MULTIPLY
```



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504  001236  177300                     DIV:    177300          ;KE11 DIVIDE
505  001240  177312                     NOR:    177312          ;KE11 NORMALIZE
506  001242  177314                     LSH:    177314          ;KE11 LOGICAL SHIFT
507  001244  177316                     ASH:    177316          ;KE11 ARITHMETIC SHIFT
508
509                                     ;TC11
510
511  001246  177342                     TCCM:   177342          ;TC11 CONTROL AND FUNCTION REGISTER
512  001250  177340                     TCST:   177340          ;TC11 GENERAL STATUS REGISTER
513  001252  177350                     TCDT:   177350          ;TC11 DATA BUFFER
514  001254  177344                     TCWC:   177344          ;TC11 WORD COUNT REGISTER
515  001256  177346                     TCBA:   177346          ;TC11 BUS ADDRESS REGISTER
516  001260  000400                     TCDRV:  400             ;DECTAPE DRIVE SELECTED FOR TEST
517
518                                     ;CR11, CM11
519
520  001262  177160                     CRS:    177160          ;CARD READER PS REGISTER ADDRESS
521  001264  177162                     CRB1:   177162          ;CARD READER CARD IMAGE DATA BUFFER
522  001266  177164                     CRB2:   177164          ;CARD READER ENCODED DATA BUFFER
523
524                                     ;CD11
525
526  001270  172460                     CDST:   172460          ;CD11 CONTROL STATUS REGISTER
527  001272  172462                     CDCC:   172462          ;CD11 COLUMN COUNT REGISTER
528  001274  172464                     CDBA:   172464          ;CD11 BUSS ADDRESS REGISTER
529
530                                     ;AD01-D
531
532  001276  176772                     ADDBR:  176772          ;AD01-D DATA BUFFER
533  001300  176770                     ADCSR:  176770          ;AD01-D CONTROL STATUS REGISTER
534  001302  176771                     ADCSRH: 176771          ;HIGH BYTE OF CONTROL STATUS REGISTER
535
536                                     ;RP11
537
538  001304  176722                     RPDA:   176722          ;RP11 CYLINDER ADDRESS DISK
539  001306  176725                     RPDAH:  176725          ;RP11 HIGH BYTE OF DISK ADDRESS
540  001310  176710                     RPDSR:  176710          ;RP11 DRIVE STATUS REGISTER
541  001312  176724                     RPDAR:  176724          ;RP11 DISK ADDRESS REGISTER
542  001314  176716                     RPWC:   176716          ;RP11 WORD COUNT REGISTER
543  001316  176720                     RPBAR:  176720          ;RP11 CURRENT ADDRESS REGISTER
544  001320  176714                     RPCSR:  176714          ;RP11  STATUS REGISTER
545  001322  176715                     RPCSRH: 176715          ;RP11 HIGH BYTE ADDRESS OF CSR
546
547                                     ;AA11
548
549  001324  176756                     SCSR:   176756          ;AA11 STATUS REGISTER
550  001326  176760                     DAC0:   176760          ;AA11 X REGISTER
551  001330  176762                     DAC1:   176762          ;AA11 Y REGISTER
552
553                                     ;DN11
554
555  001332  175200                     DNCSR:  175200          ;DN11 CONTROL STATUS REGISTER
556  001334  000340                     DNVEC:  340             ;DN11 INTERRUPT VECTOR
557  001336  000342                     DNLVL:  342             ;DN11 PRIORITY
```

```
                                ;DM11
                                ;DM11  CONTROL STATUS REGISTER
                                ;DM11  BUS ADDRESS REGISTER
                                ;DM11  BREAK STATUS REGISTER
                                ;DM11  BASE REGISTER
                                ;DM11 RECEIVER VECTOR ADDRESS
                                ;DM11 RECEIVER SERVICE LEVEL
                                ;DM11 TRANSMITTER VECTOR ADDRESS
                                ;DM11 TRANSMITTER SERVICE LEVEL

                                ;DP11

                                ;DP11 RECEIVER STATUS REGISTER
                                ;DP11 RECEIVER DATA BUFFER
                                ;DP11 TRANSMITTER STATUS REGISTER
                                ;DP11 TRANSMITTER DATA BUFFER
                                ;DP11 SYNC BUFFER
                                ;DP11 EXTENDED SYNC BUFFER
                                ;DP11 RECEIVER INTERRUPT VECTOR
                                ;DP11 RECEIVER PRIORITY
                                ;DP11 TRANSMITTER INTERRUPT VECTOR
                                ;DP11 TRANSMITTER PRIORITY

                                ;DC11 #1

                                ;DC11 #1 TRANSMITTER STATUS REGISTER
                                ;DC11 #1 TRANSMITTER DATA BUFFER
                                ;DC11 #1 RECEIVER STATUS REGISTER
                                ;DC11 #1 RECEIVER DATA BUFFER

                                ;DC11 #2

                                ;DC11 #2 RECEIVER STATUS REGISTER
                                ;DC11 #2 RECEIVER DATA BUFFER
                                ;DC11 #2 TRANSMITTER STATUS REGISTER
                                ;DC11 #2 TRANSMITTER DATA BUFFER

                                ;AFC11

                                ;AFC11 CONTROL STATUS REGISTER
                                ;AFC11 DATA BUFFER
                                ;AFC11 CHANNEL ADDRESS REGISTER

                                ;TM11

                                ;TM11 STATUS REGISTER
                                ;TM11 COMMAND REGISTER
                                ;TM11 BYTE COUNT REGISTER
                                ;TM11 CURRENT ADDRESS REGISTER

                                ;KW11-P
```



```
                                ;KW11-P CONTROL REGISTER
                                ;KW11-P COUNT SET BUFFER
                                ;KW11-P COUNTER BUFFER

                                ;DR11-B

                                ;DR11-B DATA BUFFER
                                ;DR11-B CONTROL STATUS REGISTER
                                ;DR11-B BUS ADDRESS REGISTER
                                ;BR11-B WORD COUNT REGISTER

                                ;UDC11

                                ;UDC11 CONTROL REGISTER
                                ;UDC11 STATUS REGISTER

                                ;KG11

                                ;KG11-A CONTROL STATUS REGISTER
                                ;KG11-A BCC REGISTER
                                ;KG11-A DATA BUFFER

                                ;BUS TESTER SECTION 1

                                ;BUS TESTER #1 DATA BUFFER
                                ;BUS TESTER #1 CURRENT ADDRESS REGISTER
                                ;BUS TESTER #1 WORD COUNT REGISTER
                                ;BUS TESTER #1 CONTROL STATUS REGISTER

                                ;BUS TESTER SECTION 2

                                ;BUS TESTER #2 DATA BUFFER
                                ;BUS TESTER #2 CURRENT ADDRESS REGISTER
                                ;BUS TESTER #2 WORD COUNT REGISTER
                                ;BUS TESTER #2 CONTROL STATUS REGISTER

                                ;BUS TESTER SECTION3

                                ;BUS TESTER #3 DATA BUFFER
                                ;BUS TESTER #3 CURRENT ADDRESS REGISTER
                                ;BUS TESTER #3 WORD COUNT REGISTER
                                ;BUS TESTER #3 CONTROL STATUS REGISTER

                                ;BUS TESTER SECTION 4

                                ;BUS TESTER #4 DATA BUFFER
                                ;BUS TESTER #4 CURRENT ADDRESS REGISTER
                                ;BUS TESTER #4 WORD COUNT REGISTER
                                ;BUS TESTER #4 CONTROL STATUS REGISTER

                                ;DM11-BB

                                ;DM11-BB CONTROL STATUS REGISTER
                                ;DM11-BB LINE STATUS REGISTER
```

```
  666  001536  000350          DMBVEC: 357                     ;DM11-BB INTERRUPT VECTOR
  667  001540  000352          DMBLVL: 352                     ;DM11-BB PRIORITY
```



```
  668                                  ,SBTTL  PROGRAM INITIALIZATION
  669
  670  001542  012706  036320  REGIN1: MOV     #STACK,SP               ;SET UP PROCESSOR STACK
  671  001546  012767  035514  176250  MOV     #PFAIL,24               ;SET UP POWER FAIL SERVICE POINTER
  672  001554  005067  034010          CLR     PFFLAG                  ;CLEAR POWER FAIL FLAG
  673  001560  005067  177256          CLR     PASCNT                  ;CLEAR PASS COUNT
  674  001564  005067  033720          CLR     ISFLG                   ;CLEAR ISOLATION FLAG
  675  001570  005067  032534          CLR     PASCT                   ;COUNT FOR PASS PARAMETERS
  676
  677                                  ;DETERMINE PROCESSOR TYPE, AND PROCESSOR OPTIONS
  678
  679  001574  012737  000004  000006  MOV     #4,@#6
  680  001602  012737  000002  000006  MOV     #RTI,@#6                ;SET UP TO RETURN FROM
  681                                                                  ;BUS ERROR TRAP
  682  001610  012700  000003          MOV     #3,R0                   ;DETERMINE PROCESSOR TYPE
  683  001614  000261                  SEC                             ;SET C BIT
  684  001616  005777  176150          TST     @PIRQ                   ;IF PIRQ EXISTS, PROCESSOR
  685                                                                  ;IS PDP-11/45, NO TRAP
  686  001622  005600                  SBC     R0                      ;IF TRAP OCCURED, C BIT NOT CLEARED
  687  001624  000261                  SEC                             ;SET C BIT
  688  001626  105737  177777          TSTB    @#PS+1                  ;IF PROCESSOR IS PDP-11/40
  689  001632  005600                  SBC     R0                      ;OR 11/45, C BIT WILL BE CLEARED
  690  001634  005037  177700          CLR     @#177700                ;IF PROCESSOR IS NOT PDP-11/10
  691                                                                  ;A TRAP WILL OCCUR
  692                                  ;R0=3, PROCESSOR IS PDP-11/45
  693                                  ;R0=2, PROCESSOR IS PDP-11/40
  694                                  ;R0=1, PROCESSOR IS PDP-11/20
  695                                  ;R0=0, PROCESSOR IS PDP-11/10
  696
  697  001640  012737  000006  000004  MOV     #6,@#4                  ;RESTORE TRAPCATCHER
  698  001646  105037  000006          CLR     @#6
  699  001652  010067  177204          MOV     R0,CONFIG               ;SAVE PROCESSOR TYPE
  700  001656  012737  001674  000010  MOV     #1$,@#10                ;SET UP ILLEGAL INSTRUCTION TRAP
  701  001664  070120                  MUL     R0,R1                   ;EXECUTE MULTIPLY INSTRUCTION
  702  001666  152767  000001  177167  BISB    #1,CONFIG+1             ;SET EIS BIT IN PROCESSOR DESCRIPTOR WORD
  703  001674  012737  001726  000010  1$:     MOV     #2$,@#10        ;SET UP NEW ILLEGAL INSTRUCTION TRAP
  704  001702  012701  036322          MOV     #STACKK,R1              ;SET UP STACK FOR FIS
  705  001706  005041                  CLR     -(R1)
  706  001710  005041                  CLR     -(R1)
  707  001712  005041                  CLR     -(R1)
  708  001714  005041                  CLR     -(R1)
  709  001716  075001                  FADD+   R1                      ;EXECUTE FIS INSTRUCTION
  710  001720  152767  000002  177135  BISB    #2,CONFIG+1             ;SET FIS BIT IN PROCESSOR DESCRIPTOR
  711  001726  012737  001760  000010  2$:     MOV     #3$,@#10        ;SET UP ILLEGAL INSTRUCTION TRAP
  712  001734  170000                  CFCC                            ;EXECUTE 11/45 FPP INSTRUCTION
  713  001736  152767  000004  177117  BISB    #4,CONFIG+1             ;SET 11/45 FPP BIT IN PROCESSOR DESCRIPTOR
  714  001744  012777  036056  034150  MOV     #FLTERR,@FPVECT         ;LOAD INTERUPT VECTOR
  715  001752  012777  000000  034144  MOV     #0,@FPVECT+2
  716  001760  012737  000012  000010  3$:     MOV     #12,@#10        ;RESTORE TRAPCATCHER
  717  001766  012737  002006  000004  MOV     #4$,@#4                 ;SET UP BUS ERROR TRAP
  718  001774  005767  175572          TST     SSR0                    ;TEST FOR MEMORY MANAGEMENT
  719  002000  152767  000010  177055  BISB    #10,CONFIG+1            ;SET MEMORY MANAGEMENT
  720  002006  012737  000006  000004  4$:     MOV     #6,@#4          ;BIT IN PROCESSOR DESCRIPTOR
  721  002014  032767  000002  177040  BIT     #2,CONFIG               ;IF PDP-11/40,OR 45
```

```
                                        REQ     START                   ;USE RTT FOR TRACE TRAP RETURN
                                        MOV     #RTT,TRTRET
                                START:  MOV     #1,BDATA1               ;SET UP BASE DATA FOR TTY READER OR KEYBOARD
                                        CLR     BDATA2                  ;SET UP BASE DATA FOR TTY PUNCH OR TELEPRINTER
                                        MOV     #1,DATA3                ;SET UP BASE DATA FOR HSP
                                        CLR     DATA4                   ;SET UP BASE DATA FOR HSP
                                        TST     42                      ;IF 42 NOT 0, ACT11 OR DDP
                                        BEQ     SETSW
                                        CMP     #LOGICAL,42             ;IF(42)=LOGICAL, ACT11
                                        BEQ     1$
                                        MOV     42,HCORE                ;SET LIMITS FOR CORE EXPANSION
                                        SUB     #200,HCORE
                                        JSR     PC,SIZER                ;GET SYSTEM CONFIGURATION
                                        BR      BEGIN4                  ;GO TO RUN
                                1$:     TSTB    ACTFLG                  ;IF ACT11, GET SYSTEM CONFIGURATION
                                        BNE     CORTS1
                                        JSR     PC,SIZER                ;DETERMINE WHAT DEVICES ARE PRESENT
                                        COMB    ACTFLG
                                        CMP     #-1,LOGICAL+2           ;IS THIS PASS QUICK VERIFY
                                        BNE     CORTS1                  ;BRANCH IF NO
                                        COMB    QVFLG                   ;SET QV FLAG
                                        BR      CORTS1
                                SETSW:  TST     SR                      ;IF SWR=0, USE PREVIOUS
                                        BEQ     CORTST                  ;DEVICE SELECTION,
                                                                        ;DETERMINE SIZE OF MEMORY

                                        ;INPUT DEVICE SELECTION FROM SWITCH REGISTER

                                SWITCH: MOV     SR,SR1                  ;SAVE 1ST SWITCH REGISTER
                                        HALT                            ;SET SWITCH FOR 2ND SET
                                        MOV     SR,SR2                  ;SAVE 2ND SWITCHES
                                        HALT                            ;GET SWITCHES FOR THIRD SET
                                        MOV     SR,SR3                  ;SAVE THIRD SWITCHES
                                        JSR     PC,@GETSW               ;GO TO USER OVERLAY FOR

                                        ;SET UP MEMORY EXPANSION TEST LOWER LIMIT

                                CORTST: MOV     #40000,LOCORE           ;START OF 12K
                                        CMP     #DMYRTS,PRIME           ;IF A FOREGROUND OVERLAY HAS BEEN
                                        BEQ     CORTSB                  ;LOADED
                                        ADD     #20000,LOCORE           ;START CORE EXPANSION IN NEXT 4K
                                CORTSB: CMP     #DMYRTI,IOTVEC          ;IF A BACKGROUND OVERLAY
                                        BEQ     .+10                    ;HAS BEEN LOADED
                                        ADD     #20000,LOCORE           ;START CORE EXPANSION

                                        ;FIND OUT HOW MUCH MEMORY IS AVAILABLE

                                CORTS1: CLR     HCORE                   ;CLEAR CORE LIMIT
                                        MOV     LOCORE,R0
                                        MOV     #1$,4                   ;SET UP RETURN FOR TIME OUT TRAP
                                        TST     (R0)+                   ;INCREMENT TILL OUT OF MEMORY
                                        BR      .-2                     ;TRAP WHEN OUT OF MEMORY
                                1$:     SUB     #1000,R0                ;DO NOT TEST INTO CORE ABOVE START OF LOADER
                                        MOV     R0,HCORE                ;HIGHEST CORE TO BE TESTED
```



```
                                BEGIN4: MOV     #6,4                    ;RESTORE TIME OUT TRAP
                                        MOV     CONFIG,R1               ;GET PROCESSOR CONFIGURATION
                                        ASL     R1
                                        BIC     #177770,R1
                                        MOV     PASTAB(R1),PASPAR       ;GET PASS PARAMETER TABLE
                                        MOV     EXITCT(R1),PASEX
                                RUNSW:  TST     42
                                        BNE     ST
                                        HALT
                                ST:     RESET                           ;PROGRAM ALSO RESTARTS HERE
                                        MOV     #STACK,SP               ;SET UP PROCESSOR STACK
                                        MOV     #340,PS                 ;LOCK OUT INTERRUPTS
                                        BIT     #1,SR1                  ;IF SR1 BIT 1=1, DO NOT
                                        BNE     STA                     ;REQUEST BUS SWITCH
                                        BIT     #20000,@DTCSR1          ;WAIT FOR SWITCH TO BE RELEASED
                                        BNE     .-6
                                        MOV     #1,@DTCSR1              ;REQUEST BUS SWITCH
                                        TSTB    @DTCSR1                 ;WAIT FOR CONNECT
                                        BPL     .-4
                                        CLR     TEMP                    ;DELAY FOR
                                        INC     TEMP                    ;BUS TESTERS
                                        BNE     .-4
                                        BIS     #1000,@DTCSR1           ;ISSUE SWITCHED BUS INIT
                                        BIT     #1000,@DTCSR1           ;WAIT FOR BUS INIT TO CLEAR
                                        BNE     .-6
                                STA:    MOV     #STACK,SP               ;SET UP STACK POINTER
                                        CLR     PRFLAG                  ;CLEAR ERROR ROUTINE IN USE FLAG

                                        ;SRTTL  DEVICE INITIALIZATION
                                        ;IF INHIBIT SWITCH FOR DEVICE=1, DO NOT INITIALIZE THAT DEVICE

                                        MOV     SR1,R1                  ;PUT INHIBIT SWITCHES IN
                                        MOV     SR2,R2                  ;GENERAL REGISTERS FOR
                                        MOV     #100,R3                 ;FASTER ACCESS
                                        MOV     #101,R4
                                        BIT     R2,#20                  ;IF SR2 BIT 4=1, DO NOT
                                        BNE     ST00                    ;INITIALIZE RK11 DISK

                                        ;RK11 DISK CONTROLLER INITIALIZATION

                                        MOV     RKDRV,@RKDAR            ;SET  DISK ADDRESS TO 0
                                        TSTB    @RKDSR                  ;WAIT FOR DRIVE READY
                                        BPL     .-4
                                        TSTB    @RKCSR                  ;WAIT FOR CONTROL READY
                                        BPL     .-4
                                        MOV     #15,@RKCSR              ;RESET DRIVE
                                        TSTB    @RKCSR                  ;WAIT FOR READY
                                        BPL     .-4
                                        BIT     #100,@RKDSR             ;TEST ACESS READY
                                        BEQ     .-6                     ;WAIT FOR ACCESS READY BIT
                                        MOV     #1,@RKCSR               ;CLEAR CONTROL
                                        TSTB    @RKCSR                  ;WAIT FOR READY
                                        BPL     .-4
                                        MOV     RKDRV,@RKDAR
```

```
                                                ;SET UP DISK FUNCTION
                                                ;WRITE IN LOW BYTE
                                                ;WRITE CHECK IN HIGH BYTE
 *02676  016777  004730  176376      MOV     LLIMIT,@RKBAR           ;SET UP ADDRESS OF
                                                ;WRITE/WRITE CHECK BUFFER
 *02614  016777  004366  176366      MOV     RKWORDCT,@RKWC          ;SET UP WORDCOUNT
 *02622  012777  000103  176364      MOV     #103,@RKCSR             ;SET INTERRUPT ENABLE,
                                                ;WRITE FUNCTION, GO
 *02630  005067  130174              CLR     WATCRK                  ;CLEAR INTERRUPT OCCURED FLAG
 *02634  032702  000400        ST321 BIT     #400,R2                 ;IF SR2 BIT 8=1, DO NOT
 *02640  001232                      BNE     ST31                    ;INITIALIZE RP11 DISK

                                    ;RP11 DISK PACK CONTROLLER INITIALIZATION

 *02642  012767  043503  004442      MOV     #43503,RPFUNCTION       ;SET UP DISK FUNCTION
                                                ;WRITE IN LOW BYTE
                                                ;WRITE CHECK IN HIGH BYTE
 *02650  016777  004666  176440  RPD1 MOV     LLIMIT,@RPBAR           ;SET UP ADDRESS OF
                                                ;WRITE/CRIT CHECK BUFFER
 *02656  016777  004426  176430      MOV     RPWORDCT,@RPWC          ;SET UP WORDCOUNT
 *02664  105777  176430              TSTB    @RPCSR                  ;WAIT FOR CONTROLLER READY
 *02670  100375                      BPL     .-4
 *02672  012777  000015  176420      MOV     #15,@RPCSR              ;RESET DRIVE
 *02700  105777  176414              TSTB    @RPCSR                  ;WAIT FOR CONTROLLER READY
 *02704  100375                      BPL     .-4
 *02706  005777  176376              TST     @RPDSR                  ;WAIT FOR ACCESS READY
 *02712  100375                      BPL     .-4
 *02714  005077  176370              CLR     @RPDSR                  ;CLR ATTENTION
 *02720  012777  000103  176372      MOV     #103,@RPCSR             ;SET INTERRUPT ENABLE
                                                ;WRITE FUNCTION
 *02726  030127  040000        ST311 BIT     R1,#40000               ;IF SR1 BIT 14=1, DO NOT
 *02732  001002                      BNE     ST1                     ;INITIALIZE TELETYPE PUNCH AND PRINTER

                                    ;KL11 TELETYPE TRANSMITTER INITIALIZATION

 *02734  050377  176144              BIS     R3,@TTCSR               ;INITIALIZE TELETYPE PUNCH AND PRINTER
 *02740  030127  100000        ST11  BIT     R1,#100000              ;IF SR1 BIT 15=1, DO NOT INITIALIZE
 *02744  001002                      BNE     ST2                     ;TELETYPE READER

                                    ;KL11 TELETYPE RECEIVER INITIALIZATION

 *02746  050477  176126              BIS     R4,@TRCSR               ;INITIALIZE TELETYPE READER
 *02752  030127  000004        ST21  BIT     R1,#4                   ;IF SR1 BIT 2=1, DO NOT
 *02756  001002                      BNE     ST3                     ;INITIALIZE HIGH SPEED PUNCH

                                    ;PC11 HIGH SPEED PUNCH INITIALIZATION

 *02760  050377  176130              BIS     R3,@HPCSR               ;INITIALIZE HIGH SPEED PUNCH
 *02764  030127  000010        ST31  BIT     R1,#10                  ;IF SR1 BIT 3=1, DO NOT
 *02770  001002                      BNE     ST4A                    ;INITIALIZE HIGH SPEED READER

                                    ;PC11 HIGH SPEED READER INITIALIZATION

 *02772  050477  176112              BIS     R4,@HRCSR               ;INITIALIZE HIGH SPEED READER
```



```
 *02776  032701  000020        ST4A1 BIT     #20,R1                  ;IF SR1 BIT 4=1, DO NOT
 *03002  001004                      BNE     ST5                     ;INITIALIZE KW11-L LINE CLOCK

                                    ;KW11-L REAL TIME CLOCK INITIALIZATION

 *03004  050377  176110              BIS     R3,@LKCSR               ;INITIALIZE LINE CLOCK
 *03010  005067  027462              CLR     WATCRL                  ;CLEAR INTERRUPT OCCURED FLAG
 *03014  032701  002000        ST51  BIT     #2000,R1                ;IF SR1 BIT 12=1, DO NOT
 *03020  001020                      BNE     ST6                     ;INITIALIZE RF11 DISK

                                    ;RF11 DISK CONTROLLER INITIALIZATION

 *03022  012767  043503  004510      MOV     #43503,FUNCTION         ;SET UP DISK FUNCTION
                                                ;WRITE IN LOW BYTE,
                                                ;WRITE CHECK IN HIGH BYTE
 *03030  105277  176124        RFD1  INCB    @RFCSRH                 ;ABORT ALL CURRENT DISK FUNCTIONS
 *03034  016777  004504  176110      MOV     WORDCT,@RFWC            ;SET UP WORD COUNT
 *03042  016777  004474  176104      MOV     LLIMIT,@RFCAR           ;SET UP ADDRESS OF WRITE/WRITE CHECK BUFFER
 *03050  116777  004464  176170      MOVB    FUNCTION,@RFCSR         ;START WRITING DATA TO DISK
 *03056  005067  027556              CLR     WATCRF                  ;CLEAR INTERRUPT OCCURED FLAG
 *03062  030103                 ST61  BIT     R1,R3                   ;IF SR1 BIT 6=1, DO NOT
 *03064  001012                      BNE     ST7                     ;INITIALIZE KW11-P PROGRAMMABLE CLOCK

                                    ;KW11-P PROGRAMMABLE CLOCK INITIALIZATION

 *03066  012777  001750  176352      MOV     #1000.,@KWCSR           ;SET CLOCK COUNTER FOR
                                                ;1000. (DECIMAL) COUNTS
 *03074  012777  000101  176340      MOV     #101,@KWCSR             ;START COUNTER AT 10KHZ
                                                ;RATE, INTERRUPT WHEN COUNTER
                                                ;GOES TO 0 (AFTER 10 MS)
 *03102  005067  005242              CLR     KWRATE                  ;NEXT COUNT RATE WILL BE 10 KHZ
 *03106  005067  027410              CLR     WATCKP                  ;CLEAR INTERRUPT OCCURED FLAG
 *03112  030127  000200        ST71  BIT     R1,#200                 ;IF SR1 BIT 7=1, DO NOT
 *03116  001015                      BNE     ST8                     ;INITIALIZE LP11 LINE PRINTER

                                    ;LP11 LINE PRINTER CONTROLLER INITIALIZATION

 *03120  012767  000040  007020      MOV     #40,SOLPAT              ;FIRST CHARACTER TO BE
                                                ;PRINTED IS A SPACE
 *03126  005067  007016              CLR     CLINCT                  ;CLEAR CLOUNN COUNT
 *03132  012737  012000  000200      MOV     #LPINTR,@#200           ;SET UP INTERRUPT SERVICE VECTOR
 *03140  012737  000200  000202      MOV     #200,@#202              ;SERVICE AT PRIORITY LEVEL 5
 *03146  012377  175750              MOV     R3,@LPCSR               ;SET INTERRUPT ENABLE
 *03152  030127  000400        ST81  BIT     R1,#400                 ;IF SR1 BIT 8=1, DO NOT
 *03156  001026                      BNE     ST9                     ;INITIALIZE BUS TESTER
                                                ;SECTIONS 1 AND 2

                                    ;BUS TESTER SECTIONS 1 AND 2 INITIALIZATION

 *03160  012777  000002  176312      MOV     #2,@ABWC                ;SET UP SECTION 1 FOR 2 BYTE TRANSFER
                                                ;DEVICE WILL SHIFT WORD FOUND
                                                ;AT BUS ADDRESS 1 PLACE LEFT
 *03166  012777  014056  176302      MOV     #REC1A,@ABCA            ;SET UP BUS ADDRESS OF DATA
 *03174  005067  010656              CLR     REC1A                   ;CLEAR TEST LOCATION
```

```
                                                        ;CLEAR PATTERN TO BE TRANSMITTED
                                                        ;CLEAR EXPECTED RESULT
                                                        ;SET UP SECTION 1 FOR
                                                        ;NPR, DATIP-DATAO,
                                                        ;INTERRUPT ON LEVEL 6
                                                        ;1MS DELAY BETWEEN INTERRUPTS
                                                        ;SET UP SECTION 2 FOR
                                                        ;INTERRUPT ON LEVEL 7
                                                        ;100 US DELAY BETWEEN INTERRUPTS
                                                        ;CLEAR BUS TESTER SECTION
                                                        ;1 INTERRUPT OCCURRED FLAG
                                                        ;CLEAR BUS TESTER SECTION 2
                                                        ;INTERRUPT OCCURED FLAG
                                                        ;IF SR1 BIT 9=1, DO NOT
                                                        ;INITIALIZE BUS TESTER
                                                        ;SECTIONS 3 AND 4

                                                        ;BUS TESTER SECTIONS 3 AND 4 INITIALIZATION

                                                        ;SET UP SECTION 3
                                                        ;FOR 200 WORD TRANSFER
                                                        ;SET UP BUS ADDRESS OF DATA
                                                        ;SET UP SECTION 3 FOR
                                                        ;NPR, DATO,
                                                        ;INTERRUPT ON LEVEL 5
                                                        ;DELAY BETWEEN TRANSFERS
                                                        ;SET UP SECTION 4 FOR
                                                        ;NPR, DATO
                                                        ;INTERRUPT ON LEVEL 4,
                                                        ;NO DELAY BETWEEN TRANSFERS
                                                        ;CLEAR BUS TESTER SECTION 3
                                                        ;INTERRUPT OCCURED FLAG
                                                        ;CLEAR BUS TESTER SECTION 4
                                                        ;INTERRUPT OCCURED FLAG
                                                        ;IF SR1 BIT 13=1, DO NOT
                                                        ;INITIALIZE TC11 DECTAPE

                                                        ;TC11 DECTAPE CONTROLLER INITIALIZATION

                                                        ;SET UP INTERRUPT VECTOR
                                                        ;FOR FORWARD ENDZONE DETECTED
                                                        ;SERVICE ROUTINE
                                                        ;SELECT DRIVE TO BE TESTED
                                                        ;SET DECTAPE INTERRUPT ENABLE
                                                        ;SET READ BLOCK NUMBER AND
                                                        ;REVERSE FUNCTIONS
                                                        ;START TRANSPORT
                                                        ;IF SR1 BIT 12=1, DO NOT
                                                        ;INITIALIZE RC11 DISK

                                                        ;RC11 DISK CONTROLLER INITIALIZATION

                                                        ;SET UP DISK FUNCTION
                                                        ;WRITE IN LOW BYTE
```



```
                                                        ;WRITE CHECK IN HIGH BYTE
                                                        ;INITIALIZE DISK ADDRESS REGISTER
                                                        ;SET DISK INTERRUPT ENABLE
                                                        ;CLEAR RC11 INTERRUPT
                                                        ;OCCURED FLAG
                                                        ;CLEAR TRANSMIT DATA FOR
                                                        ;DC11 #1
                                                        ;CLEAR EXPECTED RECEIVE
                                                        ;DATA FOR DC11 #1
                                                        ;CLEAR TRANSMIT DATA FOR
                                                        ;DC11 #2
                                                        ;CLEAR EXPECTED RECEIVE
                                                        ;DATA FOR DC11 #2
                                                        ;IF SR2 BIT 0=1, DO NOT
                                                        ;INITIALIZE DC11 #1

                                                        ;DC11 #1 ASYNCHRONOUS LINE UNIT INITIALIZATION

                                                        ;CLEAR DC11 #1 TRANSMITTER
                                                        ;DATA BUFFER TO TRANSMIT
                                                        ;0S AS FIRST CHARACTER
                                                        ;SET DC11 #1 TRANSMITTER
                                                        ;INTERRUPT ENABLE
                                                        ;SET MAINTENANCE MODE
                                                        ;SET FOR HIGHEST SPEED
                                                        ;SET DC11 #1 RECEIVER
                                                        ;INTERRUPT ENABLE
                                                        ;SET FOR HIGHEST SPEED
                                                        ;CLEAR DC11 #1 INTERRUPT
                                                        ;OCCURED FLAG
                                                        ;IF SR2 BIT 1=1, DO NOT
                                                        ;INITIALIZE DC11 #2

                                                        ;DC11 #2 ASYNCHRONOUS LINE UNIT INITIALIZATION

                                                        ;SET DC11 #2 TRANSMITTER
                                                        ;INTERRUPT ENABLE
                                                        ;SET MAINTENANCE MODE
                                                        ;SET FOR HIGHEST SPEED
                                                        ;CLEAR DC11 #2
                                                        ;TRANSMITTER DATA BUFFER
                                                        ;SET DC11 #2 RECEIVER
                                                        ;INTERRUPT ENABLE
                                                        ;SET FOR HIGHEST SPEED
                                                        ;CLEAR DC11 #2
                                                        ;INTERRUPT OCCURED FLAG
                                                        ;IF SR2 BIT 2=0, INITIALIZE
                                                        ;AA11 D/A CONVERTER
                                                        ;IF SR3 BIT 4=1, DO NOT
                                                        ;INITIALIZE VR20 2 COLOR SCOPE

                                                        ;AA11 WITH SCOPE OPTION INITIALIZATION

                                                        ;SET UP INTERRUPT VECTOR
```

```
1046  003512  013777  175606          MOV     R3,@SCSR            ;SET SCOPE CONTROL
1047                                                              ;INTERRUPT ENABLE
1048  003516  032227  000010  ST1D1:   BIT     R2,#10              ;IF SR2 BIT 3=1, DO NOT
1049  003522  001043                   BNE     ST3B                ;INITIALIZE AFC11
1050                                                              ;ANALOG MULTIPLEXER
1051
1052                                    ;AFC11 ANALOG MULTIPLEXER INITIALIZATION
1053
1054  003524  112767  177760  002504   MOVB    #-20,AFCTR1         ;SET UP TO CLEAR
1055  003532  012767  006244  002472   MOV     #AFTAB1,AFPTR       ;AFC11 DATA TABLES
1056  003540  005077  002466  ST1D11:  CLR     @AFPTR              ;CLEAR TABLES
1057  003544  062767  000002  002460   ADD     #2,AFPTR
1058  003552  105267  002460          INCB    AFCTR1
1059  003556  001370                   BNE     ST1D1
1060  003560  012767  006244  002444   MOV     #AFTAB1,AFPTR       ;SET UP POINTERS
1061  003566  112767  177770  002442   MOVB    #-10,AFCTR1         ;AND SAMPLE COUNTS
1062  003574  116767  002436  002435   MOVB    AFCTR1,AFCTR2       ;FOR STORAGE OF
1063                                                              ;INDIVIDUAL SAMPLES
1064                                                              ;AND AVERAGES FOR EACH
1065                                                              ;CHANNEL TO BE TESTED
1066  003602  005067  002434          CLR     AFPFLG              ;CLEAR PASS FLAG
1067                                                              ;TO ENABLE GENERATING
1068                                                              ;TABLE OF AVERAGES
1069  003606  012767  000000  002424   MOV     #0,AFSEL            ;SELECT CHANNEL 0
1070                                                              ;AT GAIN OF 1000
1071  003614  013777  175604          MOV     R3,@AFCSR           ;SET INTERRUPT ENABLE
1072  003620  016777  002414  175602   MOV     AFSEL,@AFCAR        ;START CONVERSION
1073  003626  005067  027154          CLR     WATCAF              ;CLEAR INTERRUPT OCCURED FLAG
1074  003632  032227  000200  ST3B1:   BIT     R2,#200             ;IF SR2 BIT 7=1, DO NOT
1075  003636  001016                   BNE     ST4T                ;INITIALIZE AD01-D ANALOG
1076                                                              ;TO DIGITAL CONVERTER
1077
1078                                    ;AD01-D ANALOG TO DIGITAL CONVERTER INITIALIZATION
1079
1080
1081  003640  012767  006546  002666   MOV     #ADTAB,TBPTR        ;LOAD POINTER
1082  003646  005267  002664          INC     ADTEMP              ;SET FLAG TO INDICATE FIRST PASS
1083  003652  112777  000134  175420   MOVB    #134,@ADCSR         ;ENABLE INTERRUPTS, SET GAIN
1084                                                              ;((13*X8,120=X4,11*X2,10*X1)
1085  003660  105077  175416          CLRB    @ADCSRO             ;START CONVERSION VIA DATOB TO HIGH BYTE
1086  003664  005067  002650          CLR     CHOUT
1087  003670  005067  027156          CLR     WATCAD              ;CLEAR INTERRUPT OCCURED FLAG
1088  003674  032722  004000  ST4T1:   BIT     #4000,R2            ;IF SR2 BIT 11=1, DO NOT
1089  003700  001075                   BNE     DP11A               ;INITIALIZE TM11 MAGNETIC TAPE
1090
1091                                    ;TM11 MAGNETIC TAPE TRANSPORT CONTROLLER INITIALIZATION
1092
1093  003702  012767  007546  174314   MOV     #TM11,MTIV          ;SET UP INTERRUPT VECTOR
1094                                                              ;TO REWIND TAPE
1095  003710  013777  175520          MOV     R3,@MTC             ;SET INTERRUPT ENABLE
1096  003714  032722  040000  DP11A1:  BIT     #40000,R2           ;IF SR2 BIT 14=1, DO NOT
1097  003720  001040                   BNE     DMPRIME             ;INITIALIZE DP11-A
1098                                                              ;SYNCHRONOUS INTERFACE
1099
```



```
1100                                    ;DP11-A SYNCHRONOUS INTERFACE INITIALIZATION
1101
1102  003722  005067  004670          CLR     DPRDATA             ;CLEAR EXPECTED RECEIVER DATA
1103  003726  005067  004666          CLR     DPTDATA             ;CLEAR TRANSMITTER DATA
1104  003732  012777  000300  175436   MOV     #300,@DPRP          ;SET UP TO SERVICE
1105                                                              ;RECEIVER INTERRUPTS
1106                                                              ;AT LEVEL 6
1107  003740  012777  000240  175434   MOV     #240,@DPTP          ;SET UP TO SERVICE
1108                                                              ;TRANSMITTER INTERRUPTS
1109                                                              ;AT LEVEL 5
1110  003746  012777  010374  175424   MOV     #DP11T,@DPTIV       ;SET UP TRANSMITTER
1111                                                              ;INTERRUPT SERVICE VECTOR
1112  003754  012777  010462  175412   MOV     #DP11R,@DPRIV       ;SET UP RECEIVER INTERRUPT
1113                                                              ;SERVICE VECTOR
1114  003762  012767  000004  004624   MOV     #4,DCCCNT           ;SET UP TO TRANSMIT 4
1115                                                              ;SYNC CHARACTERS
1116  003770  116777  004616  175372   MOVB    DPTSYNC,@DPSYNC     ;LOAD TRANSMITTER
1117                                                              ;SYNC BUFFER
1118  003776  105077  175370          CLRB    @DPESYN             ;CLEAR EXTENDED SYNC BUFFER
1119  004002  052777  000105  175350   BIS     #105,@DPRS          ;SET RECEIVER INTERRUPT
1120                                                              ;ENABLE, MAINTENANCE MODE
1121                                                              ;STRIP SYNC MODE
1122  004010  052777  000302  175346   BIS     #302,@DPTS          ;SET TRANSMITTER STATUS
1123                                                              ;INTERRUPT ENABLE, TRANSMIT
1124                                                              ;DONE INTERRUPT ENABLE
1125                                                              ;IDLE SYNC MODE
1126  004016  005067  027052          CLR     WATCDP              ;CLEAR INTERRUPT OCCURED FLAG
1127  004022  032722  100000  DMPRIM1: BIT     #100000,R2          ;IF SR2 BIT 15=1, DO NOT
1128  004026  001121                   BNE     ST13                ;INITIALIZE DM11
1129
1130                                    ;DM11 16 LINE ASYNCHRONOUS MULTIPLEXER INITIALIZATION
1131
1132  004030  012777  011400  175310   MOV     #DMCAT,@DMBAS       ;INITIALIZE DM BASE REGISTER
1133  004036  005077  175276          CLR     @DMCSR              ;CLEAR DM CONTROL STATUS REGISTER
1134  004042  005067  005532          CLR     TUMTAB              ;CLEAR FIRST TUMBLE TABLE ENTRY
1135  004046  012767  177777  005364   MOV     #-1,DMWCT           ;SET UP TO TRANSMIT 1 CHARACTER
1136  004054  012767  177777  005456   MOV     #-1,DMMSK           ;PRESET THE CHARACTER MASK
1137  004062  012767  011540  005310   MOV     #DMMSK,DMCAT        ;LOAD CURRENT ADDRESS(LINE 0)
1138  004070  012777  000005  175242   MOV     #,MAINT+,GO,@DMCSR  ;SET MAINT &GO BITS
1139  004076  052777  000001  175236   BIS     #1,@DMBAR           ;ENABLE LINE 0 TO
1140                                                              ;TRANSMIT 1 CHARACTER
1141                                                              ;WHICH IS ALL 1S
1142  004104  005777  175230          TST     @DMCSR              ;WAIT FOR TRANSMITTER
1143  004110  100375                   BPL     .-4                 ;TO FINISH
1144  004112  105777  175222          TSTB    @DMCSR              ;WAIT FOR RECEIVER
1145  004116  100375                   BPL     .-4                 ;TO FINISH
1146  004120  146767  005454  005412   RICB    TUMTAB,DMMSK        ;USE RECEIVED CHARACTER
1147                                                              ;TO GENERATE CHARACTER AMSK
1148  004126  005077  175206          CLR     @DMCSR              ;CLEAR CONTROL REGISTER
1149
1150  004132  012720  011400          MOV     #DMCAT,R0           ;SET UP TO LOAD CURRENT
1151  004136  012721  000020          MOV     #16.,R1             ;ADDRESS TABLE FOR TRANSMITTER
1152  004142  012720  014606  DMPRIA1: MOV     #PROCTS,(R0)+       ;EACH LINE WILL USE
1153                                                              ;PROCESSOR TEST CODE AS
```

```
                                                                ;ITS TRANSMIT BUFFER
 %04146  005301                         DEC     R1
 %04150  001374                         BNE     DMPRIA
 %04152  012700  011440                 MOV     #DMWCT,R0               ;SET UP TO LOAD
 %04156  012701  000020                 MOV     #16.,R1                 ;CURRENT ADDRESS TABLE
 %04162  012720  177400         DMPRIB: MOV     #-400,(R0)+             ;TRANSMIT 400(OCTAL)
                                                                ;BYTES ON EACH LINE
 %04166  005301                         DEC     R1
 %04170  001374                         BNE     DMPRIB
 %04172  012700  011600                 MOV     #TUMTAB,R0
 %04176  012701  000100                 MOV     #64.,R1
 %04202  005020         DMPRIC: CLR     (R0)+                   ;CLEAR TUMBLE TABLE
 %04204  005301                         DEC     R1
 %04206  001375                         BNE     DMPRIC
 %04210  005067  005326                 CLR     DMTDAT                  ;CLEAR RECEIVED DATA POINTER
 %04214  012767  011600  005322         MOV     #TUMTAB,DMPTR           ;SET UP POINTER TO TUMBLE TABLE
 %04222  012777  011226  175120         MOV     #DM11R,@DMRVEC          ;SET UP RECEIVER
                                                                ;INTERRUPT SERVICE VECTOR
 %04230  012777  000240  175114         MOV     #,DMPRTY,@DMPRTV        ;SET UP TO SERVICE
                                                                ;INTERRUPT AT LEVEL5
 %04236  012777  011072  175110         MOV     #DM11T,@DMTVEC          ;SET TRANSMITTER
                                                                ;INTERRUPT SERVICE VECTOR
 %04244  012777  000240  175104         MOV     #,DMPRTY,@DMTPRTV       ;SET UP TO SERVICE TRANSMITTER
                                                                ;INTERRUPT AT LEVEL 5
 %04252  012777  010105  175060         MOV     #,GO+,MAINT+,RIE+,TIE,@DMCSR
                                                                ;SET RECEIVER INTERRUPT ENABLE
                                                                ;TRANSMITTER INTERRUPT ENABLE
                                                                ;MAINTENANCE MOD AND GO
 %04260  016777  005262  175054         MOV     DMBARIM,@DMBAR          ;ENABLE ALL LINES FOR
                                                                ;TRANSMISSION
 %04266  005067  026622                 CLR     WATCOM                  ;CLEAR INTERRUPT OCCURED FLAG
 %04272                         ST131:
 %04272  032767  000002  174550 ST121: BIT     #2,SR3                  ;IF SR3 BIT 1=1, DO NOT
 %04300  001027                         BNE     ST4                     ;INITIALIZE CD11 CARD READER

                                        ;CD11 CARD READER INITIALIZATION

 %04302  012767  005160  173720         MOV     #CDISR,CRDRIV           ;SET UP VECTOR FOR CR11
                                                                ;SERVICE ROUTINE
 %04310  012767  000200  173714         MOV     #200,CRDRPS             ;SERVICE AT LEVEL 4
 %04316  012777  000400  174744         MOV     #400,@CDST              ;POWER CLEAR CD11
 %04324  012777  000100  174736         MOV     #100,@CDST              ;SET CD11 INTERRUPT ENABLE
 %04332  032777  010000  174730         BIT     #010000,@CDST           ;IS READER OFF LINE
 %04340  012777  177600  174724         MOV     #-120,@CDCC             ;SET UP FOR 80 COLUMN CARDS
 %04346  012777  005426  174720         MOV     #CDBUFF,@CDBA           ;SET UP BUS ADDRESS REGISTER
 %04354  005277  174710                 INC     @CDST                   ;START CARD READER
 %04360                         ST031:
 %04360  036727  174460  000040 ST141: BIT     SR1,#40                 ;IF SR1 BIT 5=1, DO NOT
 %04366  001016                         BNE     ST100                   ;INITIALIZE CR11/CM11 CARD READER

                                        ;CR11, CM11 CARD READER INITIALIZATION

 %04370  012767  004714  173632         MOV     #CRCM11,CRDRIV          ;SET UP VECTOR FOR CR11/CM11
                                                                ;INTERRUPT SERVICE ROUTINE
```



```
 %04376  012767  000300  173626         MOV     #300,CRDRPS             ;SERVICE AT LEVEL 6
 %04404  005067  000542                 CLR     CRCK1                   ;CLEAR CHECKSUM 1
 %04410  005067  000540                 CLR     CRCK2                   ;CLEAR CHECKSUM 2
 %04414  005067  000536                 CLR     CRCLCT                  ;CLEAR CARD READER COLUMN COUNT
 %04420  010477  174036                 MOV     R4,@CRS                 ;START READING AND ENABLE INTERRUPTS
 %04424  004777  174372         ST100: JSR     PC,@PRIME               ;CALL TO USER DEVICE PRIMING CODE
 %04430  042767  000340  173340         BIC     #340,PS                 ;ALLOW INTERRUPTS
 %04436  000471                         BR      .+4
 %04440  000001         MAINLI: WAIT                                    ;WAIT HERE FOR INTERRUPTS
                                                                ;IF PROCESSOR TEST IS INHIBITED
 %04442  036727  173122  002000 MAINS1: BIT     SR,#2000                ;IF SR BIT 10=1,
 %04450  001373                         BNE     MAINLI                  ;INHIBIT PROCESSOR TEST
 %04452  000167  010130                 JMP     PROCTS
```

```
1221                                    ;SBTTL  TELETYPE RECEIVER INTERRUPT SERVICE
1222
1223  *04456  105777  174416          TTYINR: TSTB    @TRCSR                  ;IS DONE SET
1224  *04462  100401                          BMI     .+4
1225  *04464  104000                          HLT                             ;FALSE RETURN FROM MAINLINE
1226  *04466  105777  174410                  TSTB    @TRDB                   ;TEST DATA FOR LEADER
1227  *04472  001412                          BEQ     TTYIN2                  ;IF LEADER GO BACK
1228  *04474  127767  174402  000006          CMPB    @TRDB,BDATA1            ;NOT LEADER TEST FOR DATA
1229  *04502  001401                          BEQ     TTYIN3
1230  *04504  104000                          HLT                             ;DATA COMPARISON ERROR
1231  *04506  105227                  TTYIN3: INCB    (PC)+                   ;INCREMENT DATA
1232  *04510  000000                  BDATA1: 0
1233  *04512  001002                          BNE     TTYIN2
1234  *04514  005267  177770          TTYIN1: INC     BDATA1                  ;BASE DATA
1235  *04520  005277  174354          TTYIN2: INC     @TRCSR                  ;START READER
1236  *04524  000002                          RTI                             ;RETURN TO MAINLINE
1237
1238
1239                                    ;SBTTL  TELETYPE TRANSMITTER INTERRUPT SERVICE
1240
1241  *04526  105777  174352          TYOUTR: TSTB    @TTCSR                  ;TEST FOR DONE
1242  *04532  100441                          BMI     .+4                     ;BRANCH IF FLAG FOUND
1243  *04534  104000                          HLT                             ;FALSE INTERRUPT RETURN
1244  *04536  105227                          INCB    (PC)+                   ;INCREMENT DATA
1245  *04540  000000                  BDATA2: 0
1246  *04542  116777  177772  174336  TYOUT1: MOV     BDATA2,@TTDBR
1247  *04550  000002                  TYOUT2: RTI                             ;RETURN TO MAINLINE
1248                                  ;HSR SECTION VALUES 2 TO 377
1249
1250                                    ;SBTTL  HIGH SPEED READER INTERRUPT SERVICE
1251
1252  *04552  105777  174332          HSRINR: TSTB    @HRCSR
1253  *04556  100401                          BMI     .+4
1254  *04560  104000                          HLT                             ;FALSE RETURN FROM MAINLINE
1255  *04562  105777  174324                  TSTB    @HRDBR                  ;TEST DATA FOR LEADER
1256  *04566  001412                          BEQ     HSRIN2                  ;IF LEADER GO BACK
1257  *04570  127767  174316  000006          CMPB    @HRDBR,DATA3            ;NOT LEADER TEST FOR DATA
1258  *04576  001401                          BEQ     .+4
1259  *04600  104000                          HLT                             ;DATA COMPARISON ERROR
1260  *04602  105227                          INCB    (PC)+                   ;INCREMENT DATA
1261  *04604  000000                  DATA3:  0
1262  *04606  001002                          BNE     HSRIN2
1263  *04610  005267  177770          HSRIN1: INC     DATA3                   ;BASE DATA
1264  *04614  005277  174270          HSRIN2: INC     @HRCSR                  ;START READER
1265  *04620  000002                          RTI                             ;RETURN TO MAINLINE
1266
1267
1268                                    ;SBTTL  HIGH SPEED PUNCH INTERRUPT SERVICE
1269
1270  *04622  105777  174266          HPOUTR: TSTB    @HPCSR                  ;TEST FOR DONE
1271  *04626  100401                          BMI     .+4                     ;BRANCH IF FLAG FOUND
1272  *04630  104000                          HLT                             ;FALSE INTERRUPT RETURN
1273  *04632  032767  000010  174264          BIT     #10,SR1                 ;IF HIGH SPEED READER WAS
1274  *04640  001016                          BNE     HPOUT2                  ;NOT SELECTED, DO NOT ENABLE
```



```
1275  *04642  042777  000100  174240          BIC     #100,@HRCSR             ;CLEAR HSR INTERRUPT ENABLE
1276  *04650  005267  000036                  INC     INTCNT                  ;COUNT INTERRUPTS
1277  *04654  026727  000032  000006          CMP     INTCNT,#6               ;HAVE TO TURN READER ON?
1278  *04662  001005                          BNE     HPOUT2                  ;NO-NEED MORE TIME
1279  *04664  005067  000022                  CLR     INTCNT                  ;YES RESET COUNTER
1280  *04670  052777  000100  174212          BIS     #100,@HRCSR             ;SET READER INT ENABLE
1281  *04676  105227                  HPOUT2: INCB    (PC)+                   ;INCREMENT DATA
1282  *04700  000000                  DATA4:  0
1283  *04702  116777  177772  174206  HPOUT1: MOV     DATA4,@HPDBR            ;OUTPUT TO DEVICE
1284  *04710  000002                          RTI                             ;RETURN TO MAINLINE
1285  *04712  000000                  INTCNT: 0
1286
1287
1288                                    ;SBTTL  CR11,CM11 CARD READER INTERRUPT SERVICE
1289
1290  *04714  105777  174342          CRCM11: TSTB    @CRS                    ;CHECK COLUMN READY
1291  *04720  100015                          BPL     CRCHK1                  ;BRANCH IF NOT SET
1292  *04722  005267  000230                  INC     CRCLCT                  ;COUNT NUMBER OF COLUMNS
1293  *04726  067767  174332  000216          ADD     @CRB1,CRCK1             ;ADD DATA TO CHECKSUM 1
1294  *04734  067767  174326  000212          ADD     @CRB2,CRCK2             ;ADD ENCODED DATA TO CHECKSUM 2
1295  *04742  105777  174314                  TSTB    @CRS                    ;CHECK COLUMN READY
1296  *04746  100001                          BPL     .+4                     ;BRANCH IF CLEARED
1297  *04750  104000                          HLT                             ;READING DATA DIDN'T CLEAR COLUMN READY
1298  *04752  000002                          RTI                             ;RETURN
1299  *04754  032777  040000  174300  CRCHK1: BIT     #40000,@CRS             ;CHECK FOR CARD DONE
1300  *04762  001447                          BEQ     CRCHK2                  ;BRANCH IF NOT SET
1301  *04764  022767  000120  000164          CMP     #80.,CRCLCT             ;CHECK FOR EIGHTY COLUMNS
1302  *04772  001426                          BEQ     CR1                     ;BRANCH IF OK
1303  *04774  022767  000050  000154          CMP     #40.,CRCLCT             ;40 COLUMNS
1304  *05002  001433                          BEQ     CRCHK6
1305  *05004  104000                          HLT                             ;TOTAL NUMBER OF COLUMNS READ NOT 80 OR 40
1306  *05006  000423                          BR      CRCHK4
1307  *05010  026767  000132  000134  CR1:   CMP     CRSUM1,CRCK1            ;CHECK FOR CORRECT ALPHA CARD IMAGE SUM
1308  *05016  001401                          BEQ     CRCONT                  ;BRANCH IF CORRECT
1309  *05020  104000                          HLT                             ;CARD IMAGE CHECKSUM INCORRECT
1310  *05022  026767  000122  000124  CRCONT: CMP     CRSUM2,CRCK2            ;CHECK FOR CORRECT ALPHA ENCODED SUM
1311  *05030  001401                          BEQ     CRCNT                   ;BRANCH IF CORRECT
1312  *05032  104000                          HLT                             ;ENCODED CHECKSUM INCORRECT
1313  *05034  005777  174222          CRCNT:  TST     @CRS                    ;CHECK FOR ERROR
1314  *05040  100001                          BPL     .+4                     ;BRANCH IF NOT SET
1315  *05042  104000                          HLT                             ;ERROR BIT WAS SET
1316  *05044  032777  020000  174210          BIT     #020,@CRS               ;CHECK OFF-LINE (BIT 8)
1317  *05052  001401                          BEQ     .+4                     ;BRANCH IF NOT SET
1318  *05054  000002                          RTI                             ;IF READER OFF-LINE, DON'T START UP AGAIN
1319  *05056  005067  000074          CRCHK4: CLR     CRCLCT                  ;CLEAR COLUMN COUNT
1320  *05062  005067  000064                  CLR     CRCK1                   ;CLEAR CHECKSUMS
1321  *05066  005067  000062                  CLR     CRCK2
1322  *05072  012777  000101  174162  CRCHK6: MOV     #101,@CRS               ;CLEAR INTERRUPTING CONDITION, RESTART READER
1323  *05100  000002                          RTI                             ;RETURN
1324  *05102  105777  174154          CRCHK2: TST     @CRS                    ;CHECK BIT 15
1325  *05106  100006                          BPL     CRCHK3                  ;BRANCH IF NOT SET
1326  *05110  032777  020000  174144          BIT     #020,@CRS               ;CHECK OFF-LINE (BIT 8)
1327  *05116  001007                          BNE     CRCHK5                  ;BRANCH IF SET TO WAIT FOR ON-LINE
1328  *05122  104000                          HLT                             ;ERROR BIT WAS SET, OTHERS WEREN'T
```

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 1329  005122  000405                    BR      CRCHK5
 1330  005124  032777  002000  174130  CRCHK3: BIT     #2000,@CRS              ;CHECK BIT 13
 1331  005132  001351                    BNE     CRCHK4                  ;BRANCH IF SET
 1332  005134  104000                    HLT                             ;NO INTERRUPTING BITS WERE SET
 1333  005136  042777  100000  174116  CRCHK5: BIC     #100000,@CRS            ;CLEAR ERROR BIT
 1334  005144  000002                    RTI                             ;RETURN
 1335  005146  067443            CRSUM1: 67443                           ;DESIRED TOTAL FOR ALPHANUMERIC CARD-IMAGE DATA
 1336  005150  014173            CRSUM2: 14173                           ;DESIRED TOTAL FOR ALPHANUMERIC ENCODED DATA
 1337  005152  000000            CRCK1:  ?                               ;RUNNING CHECKSUM FOR CARD IMAGE
 1338  005154  000000            CRCK2:  ?                               ;RUNNING CHECKSUM FOR ENCODED DATA
 1339  005156  000000            CRCLCT: ?                               ;CARD READER COLUMN COUNT
 1340
 1341                            .SBTTL  CD11 CARD READER INTERRUPT SERVICE
 1342
 1343          005426            CDTOP=CDBUFF                            ;CD11 DATA BUFFER
 1344          005546            CDENDP=CDBUFF+120                       ;END OF BUFFER IN PACKED MODE
 1345          005666            CDENDI=CDBUFF+240                       ;END OF BUFFER IN IMMAGE MODE
 1346  005160  032777  000010  174102  CDISR:  BIT     #10,@CDST               ;CHECK TRANSITION TO ON-LINE
 1347  005166  001071                    BNE     CDRET1                  ;BRANCH IF SET
 1348  005170  105777  174074            TSTB    @CDST                   ;CHECK FOR CONTROLLER READY
 1349  005174  100401                    BMI     CDISR1                  ;BRANCH IF CONTROLLER READY
 1350  005176  104000                    HLT                             ;CONTROLLER READY NOT SET
 1351
 1352  005200  005777  174064  CDISR1: TST     @CDST                   ;CHECK ERROR FLAG
 1353  005204  100473                    BMI     CDCHK1                  ;BRANCH IF SET
 1354  005206  010146                    MOV     R1,-(SP)                ;SAVE R1
 1355  005210  010246                    MOV     R2,-(SP)                ;SAVE R2
 1356  005212  005002                    CLR     R2                      ;CLEAR R2
 1357  005214  012701  005426            MOV     #CDTOP,R1               ;SET R1 AS POINTER
 1358  005220  012767  177660  177730    MOV     #-120,CRCLCT            ;SET UP COUNTER
 1359  005226  005777  174040            TST     @CDCC                   ;CHECK COLUMN COUNT REGISTER
 1360  005232  001401                    BEQ     .+4                     ;BRANCH IF OK
 1361  005234  104000                    HLT                             ;COLUMN COUNT REGISTER ERROR
 1362
 1363  005236  027727  174032  005546    CMP     @CDBA,#CDENDP           ;CHECK BUS ADDRESS FOR PACK MODE
 1364  005244  001422                    BEQ     CDLOP2                  ;BRANCH IF PACK MODE
 1365  005246  027727  174022  005666    CMP     @CDBA,#CDENDI           ;CHECK BUS ADDRESS FOR IMAGE MODE
 1366  005254  001402                    BEQ     CDLOP1                  ;BRANCH IF IMAGE MODE
 1367  005256  104000                    HLT                             ;BUS ADDRESS REGISTER ERROR
 1368
 1369  005260  000432                    BR      CDRET                   ;SKIP DATA CHECKING
 1370
 1371  005262  062102            CDLOP1: ADD     (R1)+,R2                ;ADD UP THE BUFFER
 1372  005264  005267  177666            INC     CRCLCT                  ;COUNT
 1373  005270  001374                    BNE     CDLOP1                  ;BRANCH IF NOT DONE
 1374  005272  020267  177650            CMP     R2,CRSUM1               ;CHECK THE SUM
 1375  005276  001401                    BEQ     .+4                     ;BRANCH IF OK
 1376  005300  104000                    HLT                             ;CHECKSUM ERROR, IMAGE MODE
 1377
 1378  005302  012777  000102  173760    MOV     #102,@CDST              ;SET PACKING MODE
 1379  005310  000416                    BR      CDRET                   ;CONTINUE
 1380
 1381  005312  112167  177634  CDLOP2: MOVB    (R1)+,CRCK1             ;MOVE BYTE INTO WORD
 1382  005316  066702  177630            ADD     CRCK1,R2                ;ADD UP THE BUFFER
```



```
 1383  005322  005267  177630            INC     CRCLCT                  ;COUNT
 1384  005326  001371                    BNE     CDLOP2                  ;BRANCH IF NOT DONE
 1385  005330  020267  177614            CMP     R2,CRSUM2               ;CHECK THE SUM
 1386  005334  001401                    BEQ     .+4                     ;BRANCH IF OK
 1387  005336  104000                    HLT                             ;CHECKSUM ERROR, PACKING MODE
 1388  005340  012777  000100  173722    MOV     #100,@CDST              ;CLEAR PACKING MODE BIT
 1389  005346  012602            CDRET:  MOV     (SP)+,R2                ;RESTORE R2
 1390  005350  012601                    MOV     (SP)+,R1                ;RESTORE R1
 1391  005352  012777  177660  173712  CDRET1: MOV     #-120,@CDCC             ;SET UP COLUMN COUNT
 1392  005360  012777  005426  173706    MOV     #CDBUFF,@CDBA           ;SET UP BUS ADDRESS
 1393  005366  005277  173676            INC     @CDST                   ;READ
 1394  005372  000002                    RTI
 1395  005374  032777  010000  173666  CDCHK1: BIT     #10000,@CDST            ;CHECK FOR OFF-LINE
 1396  005402  001402                    BEQ     .+6                     ;BRANCH IF NOT
 1397  005404  000002                    RTI                             ;RETURN AND WAIT FOR ON-LINE
 1398
 1399  005406  032777  027000  173654    BIT     #027000,@CDST           ;CHECK FOR OTHER ERROR BITS
 1400  005414  001402                    BEQ     .+6                     ;BRANCH IF NONE SET
 1401  005416  104000                    HLT                             ;END OF FILE ERROR (M1200 ONLY),
 1402                                                                    ;DATA ERROR, DATA LATE ERROR, OR
 1403                                                                    ;NON-EXISTANT MEMORY ERROR.
 1404  005420  000754                    BR      CDRET1                  ;GO ON TO NEXT CARD
 1405  005422  104000                    HLT                             ;CARD READER STATUS ERROR
 1406
 1407  005424  000752                    BR      CDRET1                  ;GO ON TO NEXT CARD
 1408  005426  000000            CDBUFF: 0
 1409          005670                    .=.+240
 1410
 1411                            .SBTTL  AFC11 ANALOG MULTIPLEXER INTERRUPT SERVICE
 1412
 1413  005670  105777  173530    AFC11:  TSTB    @AFCSR                  ;AFC11 DONE BIT SET?
 1414  005674  100401                    BMI     .+4
 1415  005676  104000                    HLT                             ;NO, ERROR
 1416  005700  067777  173522  000324  AFADD:  ADD     @AFDBR,@AFPTR           ;GENERATE TOTAL
 1417  005706  105267  000324            INCB    AFCTR1                  ;ALL SAMPLES IN
 1418  005712  001052                    BNE     AFEXIT                  ;NO
 1419  005714  006277  000312            ASR     @AFPTR                  ;DIVIDE TOTAL BY 10 (OCTAL)
 1420  005720  006277  000306            ASR     @AFPTR
 1421  005724  006277  000302            ASR     @AFPTR
 1422  005730  062767  000002  000274    ADD     #2,AFPTR                ;UPDATE POINTER
 1423  005736  005267  000276            INC     AFSEL                   ;ADVANCE CHANNEL
 1424  005742  105267  000271            INCB    AFCTR2                  ;ALL CHANNELS DONE?
 1425  005746  001026                    BNE     AFEXA                   ;NO
 1426  005750  005767  000266            TST     AFPFLG                  ;YES, PASS1?
 1427  005754  001040                    BNE     AFCOM                   ;NO, COMPARE RESULTS
 1428  005756  005167  000260            COM     AFPFLG                  ;PASS1, CHANGE FOR PASS2
 1429  005762  012767  006264  000242  AFSP2:  MOV     #AFTAB2,AFPTR
 1430  005770  012767  174370  000240    MOV     #174370,AFCTR1
 1431  005776  005077  000230  AFCLR:  CLR     @AFPTR                  ;CLEAR TABLE FOR PASS2
 1432  006002  062767  000002  000222    ADD     #2,AFPTR
 1433  006010  105267  000222            INCB    AFCTR1
 1434  006014  001370                    BNE     AFCLR
 1435  006016  012767  006264  000206    MOV     #AFTAB2,AFPTR           ;SET UP POINTER FOR DATA STORAGE
 1436  006024  112767  177770  000204  AFEXA:  MOVB    #-10,AFCTR1             ;SET UP TO TAKE 10(OCTAL)SAMPLES PER LINE
```

```
 1437  006032  012767  000000  000272          MOV     #0,AFSEL                ;FIRST CHANNEL IS0
 1438  006040  016777  000174  173362  AFEXIT: MOV     AFSEL,@AFCAR            ;START MULTIPLEXER
 1439  006046  012767  000001  024732          MOV     #1,WATCAF               ;SET INTERRUPT OCCURED FLAG
 1440  006054  000002                          RTI                             ;RETURN TO MAINLINE
 1441  006056  012767  006244  000146  AFCOM:  MOV     #AFTAB1,AFPTR           ;SET UP TO COMPARE DATA TABLES
 1442  006064  112767  177770  000144          MOVB    #-10,AFCTR1             ;10 (OCTAL) CHANNELS
 1443  006072  012767  006264  000134          MOV     #AFTAB2,AFPTRA          ;WILL BE COMPARED
 1444  006100  017767  000126  000132  AFCOM1: MOV     @AFPTR,AFTEMP           ;GET DATA
 1445  006106  167767  000122  000124          SUB     @AFPTRA,AFTEMP          ;COMPARE
 1446  006114  100402                          BMI     .+6                     ;GET ABSOLUTE VALUE OF DIFFERENCE
 1447  006116  005467  000116                  NEG     AFTEMP
 1448  006122  062767  000020  000110          ADD     #20,AFTEMP              ;COMPARE TO ERROR LIMIT
 1449  006130  002001                          BGE     .+4
 1450  006132  104000                          HLT                             ;DIFFERENCE NOT WITHIN LIMIT, ERROR
 1451  006134  062767  000002  000070          ADD     #2,AFPTR                ;UPDATE POINTERS
 1452  006142  062767  000002  000064          ADD     #2,AFPTRA
 1453  006150  105267  000062                  INCB    AFCTR1                  ;UPDATE COUNTER
 1454  006154  001391                          BNE     AFCOM1                  ;CONTINUE IF NOT DONE
 1455  006156  012767  006244  000046  AFMOV1: MOV     #AFTAB1,AFPTR           ;REPLACE OLD TABLE
 1456  006164  012767  006264  000042          MOV     #AFTAB2,AFPTRA          ;OF DATA WITH NEW DATA
 1457  006172  112767  177770  000036          MOVB    #-10,AFCTR1
 1458  006200  017777  000030  000024  AFMOV11: MOV     @AFPTRA,@AFPTR
 1459  006206  062767  000002  000016          ADD     #2,AFPTR
 1460  006214  062767  000002  000012          ADD     #2,AFPTRA
 1461  006222  105267  000010                  INCB    AFCTR1
 1462  006226  001354                          BNE     AFMOV1
 1463  006230  000654                          BR      AFSP2                   ;GET NEW DATA
 1464  006232  000000                  AFPTR:  0
 1465  006234  000000                  AFPTRA: 0
 1466  006236     000                  AFCTR1: .BYTE   0
 1467  006237     000                  AFCTR2: .BYTE   0
 1468                                  .EVEN
 1469  006240                          AFTEMP: 0
 1470  006240  000000                  AFSEL:  0
 1471  006242  000000                  AFAFLG: 0
 1472  006244  000000                  AFTAB1: 0
 1473          006264                  .=.+16
 1474  006264  000000                  AFTAB2: 0
 1475          006304                  .=.+16
 1476
 1477                                  .SBTTL  AD01 A/D CONVERTER INTERRUPT SERVICE
 1478
 1479  006304  005777  172770          AD01:   TST     @ADCSR                  ;CHECK FOR ERROR
 1480  006310  100001                          BPL     .+4                     ;BRANCH IF NOT SET
 1481  006312  104000                          HLT                             ;ERROR BIT WAS SET
 1482  006314  017777  172756  000212          MOV     @ADDBR,@TBPTR           ;LOAD DATA IN TABLE
 1483  006322  026727  000206  006554          CMP     TBPTR,#ADTBLA+6         ;CHECK FOR TABLE FILLED
 1484  006330  001004                          BNE     AD1                     ;BRANCH IF NOT AT END OF TABLE A
 1485  006332  012767  006556  000174          MOV     #ADTBLB,TBPTR
 1486  006340  000424                          BR      ADCK
 1487  006342  026727  000166  006564  AD1:    CMP     TBPTR,  #ADTBLB+6
 1488  006350  001004                          BNE     AD2                     ;BRANCH IF NOT AT END OF TABLE B
 1489  006352  012767  006546  000154          MOV     #ADTBLA,TBPTR
 1490  006360  000414                          BR      ADCK
```



```
 1491  006362  062767  000002  000144  AD2:    ADD     #2,TBPTR                ;MOVE POINTER
 1492  006370  005267  000144                  INC     CHOUT                   ;ERROR MAY BE SET, SO
 1493  006374  116777  000140  172700          MOVB    CHOUT,@ADCSR            ;USE A MOVE TO CLEAR IT AND START CONVERSION
 1494  006402  012767  000001  024442          MOV     #1,WATCAD
 1495  006410  000002                          RTI
 1496  006412  005767  000120          ADCK:   TST     ADTEMP                  ;TEST FOR FIRST PASS
 1497  006416  001037                          BNE     ADCONT                  ;IF SO, FILL OTHER TABLE
 1498
 1499  006420  012767  006546  000114          MOV     #ADTBLA,POINTA          ;LOAD POINTER TO TABLE A IN POINTA
 1500  006426  012767  006556  000110          MOV     #ADTBLB,POINTB          ;LOAD POINTER TO TABLE B IN POINTB
 1501  006434  017767  000102  000074  ADLOOP: MOV     @POINTA,ADTEMP          ;PUT DATA IN ADTEMP
 1502  006442  167767  000076  000066          SUB     @POINTB,ADTEMP          ;SUBTRACT SECOND READING ON SAME  CHANNEL
 1503  006450  005267  000062                  INC     ADTEMP                  ;CHECK FOR A-B<-1
 1504  006454  100001                          BPL     .+4                     ;BRANCH  IF  OK
 1505  006456  104000                          HLT                             ;DATA NOT EQUAL TO + OR - 1 LSB
 1506  006460  162767  000003  000050          SUB     #3,ADTEMP               ;CHECK FOR A-B>+1
 1507  006466  100401                          BMI     .+4                     ;BRANCH IF OK
 1508  006470  104000                          HLT                             ;DATA NOT WITHIN + OR - 1 LSB
 1509  006472  062767  000002  000042          ADD     #2,POINTA               ;MOVE POINTA
 1510  006500  062767  000002  000036          ADD     #2,POINTB               ;MOVE POINTB
 1511  006506  026727  000030  006556          CMP     POINTA,#ADTBLA+12.      ;CHECK FOR END OF TABLE
 1512  006514  001347                          BNE     ADLOOP                  ;LOOP IF NOT DONE
 1513  006516  005067  000014          ADCONT: CLR     ADTEMP                  ;FIRST PASS COMPLETE
 1514  006522  005067  000012                  CLR     CHOUT                   ;INITIALIZE CHANNEL TO CONVERT ON
 1515  006526  105077  172550                  CLRB    @ADCSR0                 ;START CONVERSION
 1516  006532  000002                          RTI
 1517
 1518  006534  000000                  TBPTR:  0
 1519  006536  000000                  ADTEMP: 0
 1520  006540  000000                  CHOUT:  0                               ;CURRENT CONVERSION CHANNEL
 1521  006542  000000                  POINTA: 0                               ;WHERE IN A
 1522  006544  000000                  POINTB: 0                               ;WHERE IN B
 1523  006546  000000                  ADTBLA: 0                               ;TABLE A
 1524          006556                          .=.+6
 1525  006556  000000                  ADTBLB: 0                               ;TABLE B
 1526          006566                          .=.+6
 1527
 1528                                  .SBTTL  AA11 WITH SCOPE INTERRUPT SERVICE
 1529
 1530                                  ;DISPLAY "PDP-11" ON SCOPE
 1531
 1532  006566  105777  172532          AA11:   TSTB    @SCSR                   ;IS DONE SET
 1533  006572  100402                          BMI     .+6
 1534  006574  104000                          HLT                             ;DONE NOT SET
 1535  006576  000002                          RTI
 1536  006600  012767  000000  027766          MOV     #0,XPOS                 ;SHOULD WORK FOR ALL SCOPES
 1537  006606  005067  027760                  CLR     YPOS
 1538  006612  012767  000006  027762          MOV     #6,CNTR                 ;6 CHARACTER COUNT
 1539  006620  012767  006522  027752          MOV     #TEXT,PNTR              ;TEXT "PDP-11"
 1540  006626  012767  006730  171304          MOV     #CHAR3,140              ;INTERRUPT VECTORS
 1541  006634  017767  027740  027724  TXT1:   MOV     @PNTR,AAR2
 1542                                  ;PLOT CHARACTER
 1543  006642  016767  027724  027726  CHAR:   MOV     XPOS,XPT                ;INIT ENTER WITH SCOPE INTERRUPT
 1544  006650  052777  000024  172446          BIS     #24,@SCSR               ;ENABLE INTENSIFY OF LOADING X
```

```
1545  006656  012767  177773  027676          MOV     #-5,AAR0                ;MATRIX COUNT (ROW)
1546  006664  012767  177771  027672  CHAR1:  MOV     #-7,AAR1                ;MATRIX COUNT (COLUMN)
1547  006672  117767  027670  027670          MOVB    @AAR2,AAR3              ;GET CHARACTER
1548  006700  005267  027662                  INC     AAR2
1549  006704  106167  027660          CHAR2:  ROLB    AAR3                    ;INTENSIFY POINT?
1550  006710  100007                          RPL     CHAR3                   ;NO
1551  006712  016777  027656  172456          MOV     XPOS,@DAC0              ;LOAD X
1552  006720  016777  027646  172452          MOV     YPOS,@DAC1              ;LOAD Y AND INTENSIFY
1553  006726  000002                          RTI                             ;RETURN TO MAINLINE
1554  006730  105777  172370          CHAR3:  TSTB    @SCSR                   ;IS DONE SET
1555  006734  100401                          BMI     .+4
1556  006736  104000                          HLT
1557  006740  062767  000070  027624          ADD     #70,YPOS                ;NEXT POINT
1558  006746  005267  027612                  INC     AAR1                    ;DONE ALL POINTS IN A COLUMN?
1559  006752  001354                          BNE     CHAR2                   ;NO
1560  006754  016767  027616  027610          MOV     YPT,YPOS                ;NEXT COLUMN
1561  006762  062767  000070  027604          ADD     #70,XPOS                ;ADD SCALE
1562  006770  005267  027566                  INC     AAR0                    ;DONE ALL COLUMNS?
1563  006774  001333                          BNE     CHAR1                   ;NO
1564  006776  062767  000070  027570          ADD     #70,XPOS                ;YES, POSITION FOR NEXT CHARACTER
1565  007004  062767  000002  027566          ADD     #2,PNTR                 ;NEXT CHARACTER
1566  007012  032767  000020  172030          BIT     #20,SR3
1567  007020  001016                          BNE     CHAR4
1568  007022  032777  001000  172274          BIT     #1000,@SCSR             ;IS GREEN BIT SET
1569  007030  001004                          BNE     .+12                    ;YES, CLEAR FOR RED
1570  007032  052777  001000  172264          BIS     #1000,@SCSR             ;NO, SET FOR GREEN
1571  007040  000403                          BR      .+10
1572  007042  042777  001000  172254          BIC     #1000,@SCSR             ;DISPLAY IN RED
1573  007050  105777  172250                  TSTB    @SCSR                   ;WAIT FOR COLOR CHANGE
1574  007054  001375                          BNE     .-4
1575  007056  005367  027520          CHAR4:  DEC     CNTR                    ;DONE ALL?
1576  007062  001264                          BNE     TXT1                    ;NO
1577  007064  042777  000002  172232          BIC     #2,@SCSR                ;INIT AND ERASE
1578  007072  000635                          BR      AA11                    ;LOOP
1579
1580                                  .SBTTL  RK11 DISK INTERRUPT SERVICE
1581
1582  007074  105777  172114          RKI1:   TSTB    @RKCSR                  ;INTERRUPT VECTOR POINTS HERE
1583  007100  100402                          BMI     .+6
1584  007102  104000                          HLT                             ;RK11 READY NOT UP
1585  007104  000417                          BR      RKSTART
1586  007106  005777  172102                  TST     @RKCSR
1587  007112  100002                          RPL     .+6
1588  007114  104000                          HLT                             ;RK11 ERROR FLAG UP
1589  007116  000412                          BR      RKSTART
1590  007120  032777  000037  172056          BIT     #37,@RKDAR              ;DISK AT UPPER LIMIT?
1591  007126  001011                          BNE     RK1                     ;NO
1592  007130  122777  000031  172050          CMPB    #31,@RKDAH
1593  007136  001005                          BNE     RK1                     ;NO
1594  007140  000367  000040                  SWAB    RKFUNCTION              ;CHANGE COMMAND
1595  007144  016777  172052  172032  RKSTART:MOV     RKDRV,@RKDAR            ;INITIALIZE DISK=DAR,DAE
1596  007152  016777  000364  172032  RK1:    MOV     LLIMIT,@RKBAR           ;CORE BASE
1597  007160  016777  000022  172022          MOV     RKWORDCT,@RKWC          ;LENGTH OF TRANSFER
1598  007166  116777  000012  172020          MOVB    RKFUNCTION,@RKCSR       ;WRITE OR WRITE CHECK TO DISK
```



```
1599  007174  012767  000001  023626          MOV     #1,WATCRK
1600  007202  000002                          RTI                             ;RETURN TO MAINLINE CODE
1601
1602  007204  000000                  RKFUNCTION:     0                       ;DISK COMMAND
1603  007206  176000                  RKWORDCT:       -2000                   ;LENGTH OF TRANSFER
1604
1605                                  .SBTTL  RP11 DISK INTERRUPT SERVICE
1606
1607  007210  105777  172104          RPI1:   TSTB    @RPCSR                  ;INTERRUPT VECTOR POINTS HERE
1608  007214  100402                          BMI     .+6
1609  007216  104000                          HLT                             ;RP11 READY NOT UP
1610  007220  000413                          BR      RPSTART
1611  007222  005777  172072                  TST     @RPCSR
1612  007226  100002                          RPL     .+6
1613  007230  104000                          HLT                             ;RP11 ERROR FLAG UP
1614  007232  000406                          BR      RPSTART
1615  007234  122777  000312  172042          CMPB    #312,@RPCA              ;CYLINDER NO. 312
1616  007242  001010                          BNE     RP1                     ;NO
1617  007244  000367  000042                  SWAB    RPFUNCTION              ;CHANGE COMMAND
1618  007250  012777  000001  172042  RPSTART:MOV     #000001,@RPCSR          ;INITIALIZE DISK = DAR=DAE
1619  007256  105777  172036                  TSTB    @RPCSR                  ;WAIT FOR CONTROL READY
1620  007262  100375                          BPL     .-4
1621  007264  016777  000252  172024  RP1:    MOV     LLIMIT,@RPBAR           ;INITIAL CORE ADDRESS
1622  007272  016777  000012  172014          MOV     RPWORDCT,@RPWC          ;LENGTH OF TRANSFER
1623  007300  116777  000006  172012          MOVB    RPFUNCTION,@RPCSR       ;WRITE OR WRITE CHECK TO DISK
1624  007306  000002                          RTI                             ;RETURN TO MAINLINE CODE
1625  007310  176000                  RPWORDCT:       -2000
1626  007312  000000                  RPFUNCTION:     0
1627
1628                                  .SBTTL  RC11 DISK INTERRUPT SERVICE
1629
1630  007314  105777  171654          RCI1:   TSTB    @RCCSR                  ;INTERRUPT VECTOR POINTS HERE
1631  007320  100402                          BMI     .+6
1632  007322  104000                          HLT                             ;RC11 READY NOT UP
1633  007324  000413                          BR      RCSTART
1634  007326  005777  171642                  TST     @RCCSR
1635  007332  100002                          RPL     .+6
1636  007334  104000                          HLT                             ;RC11 ERROR FLAG UP
1637  007336  000406                          BR      RCSTART
1638  007340  022777  003740  171620          CMP     #3740,@RCDAR            ;DISK AT UPPER LIMIT, 7740=2, 1374=3, 1774=4
1639  007346  001005                          BNE     RC2                     ;NO
1640  007350  000367  000040                  SWAB    RCFUNCTION              ;CHANGE COMMAND
1641  007354  012777  000000  171604  RCSTART:MOV     #000,@RCDAR             ;INITIALIZE DISK = DAR=DAE
1642  007362  016777  000154  171602  RC2:    MOV     LLIMIT,@RCBAR           ;CORE BASE
1643  007370  016777  000022  171572          MOV     RCWORDCT,@RCWC          ;LENGTH OF TRANSFER
1644  007376  116777  000012  171570          MOVB    RCFUNCTION,@RCCSR       ;WRITE OR WRITE CHECK TO DISK
1645  007404  012767  000001  023306          MOV     #1,WATCRC
1646  007412  000002                          RTI                             ;RETURN TO MAINLINE CODE
1647
1648  007414  000000                  RCFUNCTION:     0                       ;DISK COMMAND
1649  007416  176000                  RCWORDCT:       -2000                   ;LENGTH OF TRANSFER
1650
1651                                  .SBTTL  RF11 DISK INTERRUPT SERVICE
1652
```

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 1653  007420  105777  171532          RF11:  TSTB    @RFCSR                  ;INTERRUPT VECTOR POINTS HERE
 1654  007424  100402                         BMI     .+6
 1655  007426  104000                         HLT                             ;RF11 READY NOT UP
 1656  007430  000424                         BR      RFSTART
 1657  007432  105777  171520                TST     @RFCSR
 1658  007436  100002                         BPL     .+6
 1659  007440  104000                         HLT                             ;RF11 ERROR FLAG UP
 1660  007442  000417                         BR      RFSTART
 1661  007444  105777  171502                TST     @RFWC
 1662  007450  100002                         BPL     .+6
 1663  007452  104000                         HLT                             ;RF11 WORD COUNT NOT ZERO
 1664  007454  000412                         BR      RFSTART
 1665  007456  122777  000003  171460        CMPB    #3,@RFDAE               ;DISK AT UPPER LIMIT?(#7=2,#17=4,#77=8 DISKS)
 1666  007464  001010                         BNE     RF1                     ;NO
 1667  007466  027727  171456  174000        CMP     @RFDAR,#174000          ;AS FAR ON DISK AS WE CAN GO
 1668  007474  101424                         BLOS    RF1                     ;NO
 1669  007476  000367  000036                SWAB    FUNCTION                ;CHANGE COMMAND
 1670  007502  105277  171452        RFSTART:INCB    @RFCSR                  ;INITIALIZE DISK - DAR=DAE
 1671  007506  016777  000030  171440  RF1:  MOV     LLIMIT,@RFCAR           ;CORE BASE
 1672  007514  016777  000024  171430        MOV     WORDCT,@RFWC            ;LENGTH OF TRANSFER
 1673  007522  116777  000012  171426        MOVB    FUNCTION,@RFCSR         ;WRITE OR WRITE CHECK TO DISK
 1674  007530  012767  000001  023172        MOV     #1,WATCRF
 1675  007536  000002                         RTI                             ;RETURN TO MAINLINE CODE
 1676  007540  000030                 FUNCTION:.       .                      ;DISK COMMAND
 1677  007542  014676                 LLIMIT: PROCTS                          ;FIRST CORE ADDRESS OF TRANSFER
 1678  007544  175777                 WORDCT: -2001                           ;LENGTH OF TRANSFER
 1679
 1680                                 .SBTTL  MAG TAPE INTERRUPT SERVICE
 1681
 1682                                 ;REWIND TAPE UNIT
 1683
 1684  007546  012767  007564  170450  TM11:  MOV     #MTRWX,MTIV             ;VECTOR SETUP
 1685  007554  012777  060117  171652        MOV     #60117,@MTC             ;REWIND
 1686  007562  000002                         RTI                             ;BACK TO MAINLINE
 1687  007564  000420                 MTRWX:  BR      MTWRITE
 1688
 1689                                 ;WRITE A RECORD 800 PBI, 9TRACK, ODD PARITY
 1690  007566  012767  007620  170430  MTWRITE:MOV     #MTWRTX,MTIV            ;VECTOR
 1691  007574  016777  000412  171634          MOV     MTLENGTH,@MTBC          ;BYTE COUNT
 1692  007602  016777  000336  171630          MOV     MTWBUF,@MTCA            ;CORE ADDRESS
 1693  007610  112777  060105  171616          MOVB    #60105,@MTC             ;WRITE A RECORD
 1694  007616  000002                          RTI                             ;BACK TO MAIN LINE
 1695  007620  105777  171610          MTWRTX: TSTB    @MTC                    ;TEST FOR CU READY
 1696  007624  100401                          BMI     .+4
 1697  007626  104000                          HLT                             ;READY NOT UP ON INTERRUPT
 1698  007630  005777  171600                 TST     @MTC                    ;ANY ERROR?
 1699  007634  100005                          BPL     MTBKSP                  ;NO ERRORS - BACK SPACE
 1700  007636  032777  002000  171566          BIT     #2000,@MTS              ;IS ERROR EOT?
 1701  007644  001001                          BNE     MTBKSP                  ;HAVE EOT, CONTINUE TEST
 1702  007646  104000                          HLT                             ;ERROR WAS NOT EOT
 1703
 1704                                 ;BACK SPACE ONE RECORD
 1705  007650  012767  007672  170346  MTBKSP: MOV     #MTBKX,MTIV
 1706  007656  005177  171554                  COM     @MTBC                   ;BACK SPACE ONE RECORD
```



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 1707  007662  012777  060113  171544          MOV     #60113,@MTC             ;BACK SPACE
 1708  007670  000002                          RTI
 1709  007672  105777  171536          MTBKX:  TSTB    @MTC                    ;TEST FOR READY
 1710  007676  100401                          BMI     .+4
 1711  007700  104000                          HLT                             ;CU READY NOT UP
 1712  007702  005777  171526                  TST     @MTC                    ;TEST FOR ERRORS - BACK SPACE
 1713  007706  100001                          BPL     .+4
 1714  007710  104000                          HLT                             ;BACK SPACE ERROR
 1715
 1716                                 ;READ PREVIOUSLY WRITTEN RECORD
 1717  007712  012767  007744  170304  MTREAD: MOV     #MTRDX,MTIV             ;VECTOR
 1718  007720  016777  000266  171510          MOV     MTLENGTH,@MTBC          ;BYTE COUNT
 1719  007726  016777  000142  171504          MOV     MTRBUF,@MTCA            ;BUSS ADDRESS
 1720  007734  012777  060103  171472          MOV     #60103,@MTC             ;READ COMMAND
 1721  007742  000002                          RTI                             ;RETURN TO MAINLINE
 1722  007744  105777  171464          MTRDX:  TSTB    @MTC                    ;READ UP
 1723  007750  100401                          BMI     .+4
 1724  007752  104000                          HLT                             ;READY NOT UP ON READ INTERRUPT
 1725  007754  005777  171454                  TST     @MTC
 1726  007760  100005                          BPL     MTR1
 1727  007762  032777  002000  171442          BIT     #2000,@MTS              ;IS ERROR EOT
 1728  007770  001266                          BNE     TM11                    ;YES REWIND TAPE
 1729  007772  104000                          HLT                             ;ERROR ON READ RECORD
 1730  007774  000401                  MTR1:   BR      MTCK                    ;CHECK DATA
 1731  007776  000673                  MTR2:   BR      MTWRITE                 ;WRITE NEXT RECORD
 1732
 1733                                 ;CHECK MAG TAPE DATA BUFFERS
 1734  010000  016767  000070  000062  MTCK:   MOV     MTRBUF,MTR0             ;SET UP COUNTER
 1735  010006  026777  000060  000054  MTCK1:  CMP     MTDATA,@MTR0            ;TEST THE DATA
 1736  010014  001401                          BEQ     .+4
 1737  010016  104000                          HLT                             ;MAG TAPE DATA ERROR
 1738  010020  062767  000002  000042          ADD     #2,MTR0                 ;INCREMENT COUNTER
 1739  010026  026767  000036  000176          CMP     MTR0,ENDBUF             ;XXXXXX CHECK
 1740  010034  001364                          BNE     MTCK1                   ;LOOP TILL DONE
 1741
 1742                                 ;CLEAR THE BUFFER
 1743  010036  016767  000032  000024          MOV     MTRBUF,MTR0             ;SET UP COUNTER
 1744  010044  005077  000020          MTCK2:  CLR     @MTR0                   ;CLEAR THE BUFFER
 1745  010050  062767  000002  000012          ADD     #2,MTR0                 ;INCREMENT BEFORE WORD
 1746  010056  026767  000006  000056          CMP     MTR0,ENDBUF             ;AT UPPER LIMIT
 1747  010064  001367                          BNE     MTCK2                   ;NO - BRANCH TILL DONE
 1748  010066  000743                          BR      MTR2                    ;EXIT READ TO DO NEXT WRITE
 1749  010070  000000                  MTR0:   0                               ;MAGTAPE COUNTER
 1750  010072  052525                  MTDATA: 52525                           ;DATA TO BE TESTED FOR
 1751  010074  010076                  MTRBUF: .+2
 1752          010142                          .+44
 1753  010142  010142                  ENDBUF: .
 1754  010144  010146                  MTWBUF: .+2
 1755  010146  052525                          52525                           ;MAG TAPE WRITE BUFFER
 1756  010150  052525                          52525                           ;MAG TAPE WRITE BUFFER
 1757  010152  052525                          52525                           ;MAG TAPE WRITE BUFFER
 1758  010154  052525                          52525                           ;MAG TAPE WRITE BUFFER
 1759  010156  052525                          52525                           ;MAG TAPE WRITE BUFFER
 1760  010160  052525                          52525                           ;MAG TAPE WRITE BUFFER
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1761  010162  052525                          52525                   ;MAG TAPE WRITE BUFFER
1762  010164  052525                          52525                   ;MAG TAPE WRITE BUFFER
1763  010166  052525                          52525                   ;MAG TAPE WRITE BUFFER
1764  010170  052525                          52525                   ;MAG TAPE WRITE BUFFER
1765  010172  052525                          52525                   ;MAG TAPE WRITE BUFFER
1766  010174  052525                          52525                   ;MAG TAPE WRITE BUFFER
1767  010176  052525                          52525                   ;MAG TAPE WRITE BUFFER
1768  010200  052525                          52525                   ;MAG TAPE WRITE BUFFER
1769  010202  052525                          52525                   ;MAG TAPE WRITE BUFFER
1770  010204  052525                          52525                   ;MAG TAPE WRITE BUFFER
1771  010206  052525                          52525                   ;MAG TAPE WRITE BUFFER
1772  010210  052525                          52525                   ;MAG TAPE WRITE BUFFER
1773  010212  177734                MTLENG: -44
1774
1775                                  .SBTTL  KW11-P PROGRAMMABLE CLOCK INTERRUPT SERVICE
1776
1777  010214  012767  000001  022300  KWI1P:  MOV     #1,WATCKP               ;SET WATCHDOG BIT
1778  010222  105777  171214          KWI1PA: TSTB    @KWCSR                  ;CHECK FOR DONE BIT
1779  010226  001001                          BNE     .+4                     ;SET ON INTERRUPT
1780  010230  104000                          HLT                             ;DONE NOT SET, ERROR
1781  010232  005777  171206                  TST     @KWCSB                  ;WAS COUNT SET BUFFER
1782  010236  001401                          BEQ     .+4                     ;CLEARED BY UNDERFLOW
1783  010240  104000                          HLT                             ;NO, ERROR
1784  010242  005777  171200                  TST     @KWCTR                  ;WAS COUNTER CLEARED
1785  010246  001401                          BEQ     .+4                     ;BY UNDERFLOW
1786  010250  104000                          HLT                             ;NO, ERROR
1787  010252  005767  000072                  TST     KWRATE                  ;IF KWRATE=0,SET UP FOR
1788  010256  100423                          BMI     KW11PC                  ;100KHZ, IF NEGATIVE, LINE
1789  010260  001011                          BNE     KW11PB                  ;FREQ., IF>0, 10KHZ
1790  010262  012777  001750  171154  KWI1PA: MOV     #1000.,@KWCSR           ;SET UP FOR 1000 (DECIMAL) COUNTS
1791  010270  105167  000054                  COMB    KWRATE                  ;NEXT CLOCK RATE IS 10KHZ
1792  010274  012777  000101  171140          MOV     #101,@KWCSR             ;THIS CLOCK RATE IS 100KHZ
1793                                                                          ;CLOCK WILL INTERRUPT IN 10 MS
1794  010302  000002                          RTI
1795  010304  012777  000144  171132  KWI1PB: MOV     #100.,@KWCSB            ;SET UP FOR 100 (DECIMAL) COUNTS
1796  010312  105167  000033                  COMB    KWRATE+1                ;NEXT CLOCK RATE IS 60 HZ
1797  010316  012777  000103  171116          MOV     #103,@KWCSR             ;THIS CLOCK RATE IS 10KHZ
1798                                                                          ;CLOCK WILL INTERRUPT IN 10 MS
1799  010324  000002                          RTI
1800  010326  012777  000012  171110  KWI1PC: MOV     #10.,@KWCSB             ;SET UP FOR 10 (DECIMAL) COUNTS
1801  010334  005067  000010                  CLR     KWRATE                  ;NEXT CLOCK RATE IS 100 KHZ
1802  010340  012777  000105  171074          MOV     #105,@KWCSR             ;THIS CLOCK RATE IS 60 HZ
1803                                                                          ;CLOCK WILL INTERRUPT IN 160 MS
1804  010346  000002                          RTI
1805  010350  000000                KWRATE: 0
1806
1807                                  .SBTTL  KW11-L REAL TIME CLOCK INTERRUPT SERVICE
1808
1809  010352  105777  170542          KWI1L:  TSTB    @LKCSR                  ;TEST FOR DONE
1810  010356  100402                          BMI     .+6
1811  010360  104000                          HLT                             ;FALSE INTERRUPT
1812  010362  000403                          BR      .+10                    ;DO NOT SET WATCHDOG
1813  010364  012767  000001  022104          MOV     #1,WATCKL               ;SET WATCHDOG
1814  010372  000002                          RTI                             ;RETURN
```



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1815
1816                                  .SBTTL  DP11 SYNCHRONOUS LINE UNIT INTERRUPT SERVICE
1817
1818                                  ;SYNCHRONIZATION
1819
1820  010374  016777  000212  170764  DPI1T:  MOV     DPTSYNC,@DPTR           ;XMIT SYNC
1821  010402  005367  000206                  DEC     DCCCNT                  ;HAVE 2 SYNC'S BEEN XMITED
1822  010406  001003                          BNE     T18                     ;NO
1823  010410  012777  010420  170762          MOV     #TV19,@DPTIV            ;YES CHANGE VECTOR
1824  010416  000002                T18:    RTI
1825
1826                                  ;SEQUENTIAL DATA TRANSMITTION ROUTINE
1827
1828  010420  105777  170740          TVI9:   TSTB    @DPTS                   ;TRANSMITTER READY
1829  010424  001001                          BNE     .+4                     ;YES
1830  010426  104000                          HLT                             ;NO, REPORT FALSE INTERRUPT
1831  010430  116777  000164  170730          MOVB    DPTDATA,@DPTR           ;LOAD BUFFER
1832  010436  105267  000156                  INCB    DPTDATA                 ;NEXT CHARACTER
1833  010442  001006                          BNE     T19                     ;NO
1834  010444  012777  010374  170726  RESYNC: MOV     #DP11T,@DPTIV           ;SET UP TRANSMITTER
1835                                                                          ;INTERRUPT VECTOR
1836                                                                          ;FOR SYNC ROUTINE
1837  010452  012767  000004  000134          MOV     #4,DCCCNT               ;SET UP TO TRANSMIT
1838                                                                          ;4 SYNC CHARACTERS
1839                                                                          ;TO RE-SYNCHRONIZE RECEIVERS
1840  010460  000002                T19:    RTI
1841
1842                                  ;RECEIVE SEQUENTIAL DATA
1843
1844  010462  012767  000001  022404  DPI1R:  MOV     #1,WATCDP               ;SET INTERRUPT OCCURED FLAG
1845  010470  010446                          MOV     R4,-(SP)                ;SAVE R4 ON STACK
1846  010472  105777  170662                  TSTB    @DPRS                   ;IS RECEIVER DONE BIT SET
1847  010476  001001                          BNE     .+4
1848  010500  104000                          HLT                             ;DONE NOT SET, ERROR
1849  010502  017704  170654                  MOV     @DPRB,R4                ;SAVE RECEIVED CHARACTER
1850  010506  120467  000104                  CMPB    R4,DPRDATA              ;WAS CORRECT CHARACTER RECEIVED
1851  010512  001413                          BEQ     DP11RB                  ;IF YES, EXIT
1852  010514  032777  040000  170642          BIT     #40000,@DPTS            ;IS RECEIVER OVER RUN SET
1853  010522  001002                          BNE     DP11RA
1854  010524  104000                          HLT                             ;DATA ERROR
1855  010526  000420                          BR      DP11RRS                 ;RESTART AND RESYNC
1856  010530  104000                DPI1RA: HLT                             ;OVER RUN ERROR,
1857                                                                          ;CHANGE TO NOP TO SUPPRESS
1858                                                                          ;OVERRUN ERROR REPORTS
1859  010532  042777  040000  170624          BIC     #40000,@DPTS            ;CLEAR OVER RUN
1860  010540  000413                          BR      DP11RRS                 ;RESTART TRANSMISSION
1861  010542  105267  000050          DPI1RB: INCB    DPRDATA                 ;UPDATA EXPECTED DATA
1862  010546  001410                          BEQ     DP11RS                  ;IF END OF DATA, RESTART
1863  010550  026767  000042  000034          CMP     DPRDATA,DPTSYNC         ;IS CHARACTER TO BE TRANSMITTED SYNC
1864  010556  001002                          BNE     DP11RC                  ;IF NOT ,EXIT
1865  010560  105267  000032                  INCB    DPRDATA                 ;DO NOT RECEIVE SYNC
1866  010564  012604                DPI1RC: MOV     (SP)+,R4                ;RESTORE R4
1867  010566  000002                          RTI                             ;RETURN TO MAINLINE CODE
1868  010570  042777  004000  170562  DPI1RRS:        BIC     #4000,@DPRS     ;CLEAR RECEIVER ACTIVE
```

```
 1869  010576  012604                    MOV     (SP)+,R4                ;RESTORE R4
 1870  010600  005067  000012            CLR     DPRDATA                 ;CLEAR EXPECTED RECEIVE DATA
 1871  010604  005067  000010            CLR     DPTDATA                 ;CLEAR TRANSMIT DATA
 1872  010610  000715                    BR      RESYNC                  ;RESYNCHRONIZE RECEIVER
 1873  010612  000026            DPTSYNC: 26                              ;TEST SYNC CHARACTER
 1874  010614  000000            DCCCNT: ?                                ;SYNC COUNT
 1875  010616  000000            DPRDATA: ?                               ;RECEIVER DATA
 1876  010620  000000            DPTDATA: ?                               ;TRANSMITTER DATA
 1877
 1878                                    .SBTTL  DC11 ASYNCHRONOUS LINE UNIT #1 INTERRUPT SERVICE
 1879
 1880  010622  105777  170556    DCIIT1: TSTB    @DCTCSR                 ;TEST FOR DONE ON INTERRUPT
 1881  010626  100401                    BMI     .+4
 1882  010630  104000                    HLT                             ;FALSE INTERRUPT
 1883  010632  105227                    INCB    (PC)+                   ;INCREMENT DATA
 1884  010634  000000            DCDAT1: ?
 1885  010636  001002                    BNE     DCOUT1                  ;DONE-START OVER
 1886  010640  005067  177770    DCOUT:  CLR     DCDAT1                  ;INITILIZE DATA
 1887  010644  016777  177764  170534  DCOUT1: MOV     DCDAT1,@DCTDBR          ;TRANSMIT DATA
 1888  010652  000002                    RTI                             ;RETURN TO MAINLINE
 1889
 1890                                    ;DC11 RECEIVER ROUTINE VALUES 0 TO 377
 1891
 1892  010654  017767  170530  000060  DCIIR1: MOV     @DCRCSR,DPSSR           ;SAVE CSR, CLEARED WHEN READ
 1893  010662  100005                    BPL     DCIN5                   ;BRANCH ON NO ERROR
 1894  010664  104000                    HLT                             ;DATA SET NOT READY
 1895  010666  005067  177742            CLR     DCDAT1                  ;REINITILIZE DATA
 1896  010672  005067  000024            CLR     DCDAT2                  ;REINITILIZE DATA
 1897  010676  105767  000040    DCIN5:  TSTB    DPSSR                   ;ON INTERRUPT TEST FOR DONE
 1898  010702  100401                    BMI     .+4
 1899  010704  104000                    HLT                             ;FALSE INTERRUPT, DONE NOT SET
 1900  010706  127767  170500  000006          CMPB    @DCRDBR,DCDAT2          ;IS DATA CORRECT;
 1901  010714  001401                    BEQ     DCIN3
 1902  010716  104000                    HLT                             ;DC 11 RECEIVER DATA ERROR
 1903  010720  105227            DCIN3:  INCB    (PC)+                   ;UPDATE EXPECTED DATA PATTERN
 1904  010722  000000            DCDAT2: ?
 1905  010724  001002                    BNE     DCIN2                   ;NO-LOOK FOR THE REST
 1906  010726  005067  177770    DCIN1:  CLR     DCDAT2                  ;SET UP BASIC DATA
 1907  010732  012767  000001  022002  DCIN2:  MOV     #1,WATDC1
 1908  010740  000002                    RTI                             ;RETURN TO MAINLINE
 1909  010742  000000            DPSSR:  ?                               ;SAVE PS OF CSR
 1910  010744  000134            DCOUTF: 134                             ;CHANGE TO 134 FOR MAINTENANCE MODE
 1911                                                                    ;130 FOR TELEPHASE LINE
 1912  010746  000130            DCINF:  130                             ;CHANGE 130 TO 120 FOR SLOWER SPEED(TTY)
 1913
 1914                                    .SBTTL  DC11 ASYNCHRONOUS LINE UNIT #2 INTERRUPT SERVICE
 1915
 1916                                    ;DC11 TRANSMITTER #1 INTERRUPT SERVICE
 1917  010750  105777  170444    DCIIT2: TSTB    @DCTCSA                 ;TEST FOR DONE ON INTERRUPT
 1918  010754  100401                    BMI     .+4
 1919  010756  104000                    HLT                             ;FALSE INTERRUPT
 1920  010760  105227                    INCB    (PC)+                   ;INCREMENT DATA
 1921  010762  000000            DCDAT3: ?
 1922  010764  001002                    BNE     DCOUT3                  ;DONE-START OVER
```



```
 1923  010766  005067  177770    DCOUTA: CLR     DCDAT3                  ;INITILIZE DATA
 1924  010772  016777  177764  170422  DCOUT3: MOV     DCDAT3,@DCTDBA          ;TRANSMIT DATA
 1925  011000  000002                    RTI                             ;RETURN TO MAINLINE
 1926
 1927                                    ;DC11 RECEIVER ROUTINE VALUES: 0 TO 377
 1928  011002  017767  170406  000060  DCIIR2: MOV     @DCRSR,DPSSR1           ;SAVE CSR, CLEARED WHEN READ
 1929  011010  100005                    BPL     DCIN5A                  ;BRANCH ON NO ERROR
 1930  011012  104000                    HLT                             ;DATA SET NOT READY
 1931  011014  005067  177742            CLR     DCDAT3                  ;REINITILIZE DATA
 1932  011020  005067  000024            CLR     DCDAT4                  ;REINITILIZE DATA
 1933  011024  105767  000040  DCIN5A: TSTB    DPSSR1                  ;ON INTERRUPT TEST FOR DONE
 1934  011030  100401                    BMI     .+4
 1935  011032  104000                    HLT                             ;FALSE INTERRUPT, DONE NOT SET
 1936  011034  127767  170356  000006          CMPB    @DCRBR,DCDAT4           ;IS DATA CORRECT;
 1937  011042  001401                    BEQ     DCIN3B
 1938  011044  104000                    HLT                             ;DC 11 RECEIVER DATA ERROR
 1939  011046  105227            DCIN3B: INCB    (PC)+                   ;UPDATE EXPECTED DATA PATTERN
 1940  011050  000000            DCDAT4: ?
 1941  011052  001002                    BNE     DCIN4A                  ;NO-LOOK FOR THE REST
 1942  011054  005067  177770    DCIN3A: CLR     DCDAT4                  ;SET UP BASIC DATA
 1943  011060  012767  000001  021676  DCIN4A: MOV     #1,WATDC2
 1944  011066  000002                    RTI                             ;RETURN TO MAINLINE
 1945  011070  000000            DPSSR1: ?                               ;SAVE PS OF CSR
 1946
 1947                                    .SBTTL  DM11 ASYNCHRONOUS MULTIPLEXER INTERRUPT SERVICE
 1948
 1949                                    ;DM11 TRANSMITTER INTERRUPT SERVICE ROUTINE
 1950  011072  010046            DMIIT:  MOV     R0,-(SP)                ;SAVE R0 & R1 ON
 1951  011074  010146                    MOV     R1,-(SP)                ;THE STACK
 1952  011076  005000                    CLR     R0                      ;CLEAR INT ERROR INDICATOR
 1953  011100  032777  060000  170232    BIT     #,NEX+,OVRUN,@DMCSR     ;ERROR FLAGS ?
 1954  011106  001405                    BEQ     DMTIS                   ;BRANCH IS NO ERROR FLAGS
 1955  011110  104000                    HLT                             ;ERROR FLAG
 1956  011112  042777  060000  170220    BIC     #,NEX+,OVRUN,@DMCSR     ;CLEAR ERROR FLAG
 1957  011120  005170                    COM     R0                      ;SET INT ERROR INDICATOR
 1958  011122  005777  170212  DMTIN:  TST     @DMCSR                  ;READY FLAG?
 1959  011126  100404                    BMI     DMTIP1
 1960  011130  005700                    TST     R0                      ;INT BEACUSE OF ERROR?
 1961  011132  001032                    BNE     DMTINX                  ;YES, BUT NO READY, EXIT
 1962  011134  104000                    HLT                             ;NO ERROR, NO READY
 1963  011136  000430                    BR      DMTIPX                  ;EXIT
 1964  011140  042777  100000  170172  DMTIN1: BIC     #,READY,@DMCSR          ;CLEAR READY
 1965  011146  005000                    CLR     R0
 1966  011150  012701  000001                  MOV     #1,R1
 1967  011154  030177  170162  DMTINA: BIT     R1,@DMBAR               ;WHICH LINE FINISHED?
 1968  011160  001013                    BNE     DMTINB
 1969  011162  032167  000360                  BIT     R1,DMBARIM              ;SHOULD THIS LINE BE RESTARTED
 1970  011166  001410                    BEQ     DMTINB                  ;BRANCH IF NOT
 1971  011170  012760  014000  011400          MOV     #PROCTS,DMCAT(R0)       ;INITIALIZE WORD COUNT
 1972  011176  012760  177400  011440          MOV     #-400,DMWCT(R0)         ;CURRENT ADDRESS
 1973  011204  050177  170132                  BIS     R1,@DMBAR               ;AND RESTART LINE THAT FINISHED
 1974  011210  062700  000002  DMTINB: ADD     #2,R0
 1975  011214  006301                    ASL     R1
 1976  011216  103356                    BCC     DMTINA
```

```
1977  011220  012601                DMTINX: MOV     (SP)+,R1
1978  011222  012600                        MOV     (SP)+,R0
1979  011224  000002                        RTI                             ;EXIT
1980                                ;DM11 RECEIVER INTERRUPT SERVICE ROUTINE
1981
1982  011226  010046                DMIIP:  MOV     R0,-(SP)
1983  011230  010146                        MOV     R1,-(SP)                ;SAVE R1
1984  011232  010246                        MOV     R2,-(SP)                ;SAVE R2
1985  011234  016701  000302                MOV     DMTDAT,R1               ;GET POINTER TO DATA
1986  011240  016700  000300                MOV     DMPTR,R0
1987  011244  105777  170070                TSTB    @DMCSR                  ;DONE SET?
1988  011250  100402                        BMI     DMRINA                  ;BRANCH IF SET
1989  011252  104000                        HLT                             ;FALSE INTERRUPT
1990  011254  000434                        BR      DMRINX                  ;GO TO EXIT
1991  011256  005710                DMRINA: TST     (R0)                    ;TEST FOR VALID DATA ENTRY
1992  011260  100404                        BMI     DMRINC                  ;BRANCH IF VALID DATA ENTRY
1993  011262  104000                        HLT                             ;NO VALID DATA ENTRY
1994  011264  000430                        BR      DMRINX                  ;GO TO EXIT
1995  011266  005710                DMRINB: TST     (R0)                    ;VALID DATA ENTRY?
1996  011270  100026                        BPL     DMRINX                  ;EXIT IF NO MORE ENTRIES
1997  011272  032710  017000        DMRINC: BIT     #17000,(R0)             ;LINE ZERO
1998  011276  001011                        BNE     DMRIND
1999  011300  116102  014606                MOVB    PROCTS(R1),R2           ;GET DATA
2000  011304  046702  000230                BIC     DMMSK,R2                ;CLEAR NON TRANSMITTED BITS
2001  011310  121002                        CMPB    (R0),R2                 ;COMPARE RECEIVED & TRANSMITTED DATA
2002  011312  001401                        BEQ     .+4
2003  011314  104000                        HLT                             ;ERROR: INCORRECT DATA
2004  011316  105267  000220                INCB    DMTDAT                  ;FORM WHAT NEXT RECEIVED CHAR. SHOULD BE
2005  011322  005010                DMRIND: CLR     (R0)                    ;CLR TUMBLER TABLE ENTRY
2006  011324  020027  011776                CMP     R0,#TUMTAB+176          ;IS POINTER AT THE END OF THE TABLE
2007  011330  001002                        BNE     .+6
2008  011332  012700  011576                MOV     #TUMTAB-2,R0
2009  011336  005720                        TST     (R0)+                   ;CLEAR ENTRY AND INCREMENT POINTER
2010  011340  010067  000200                MOV     R0,DMPTR                ;RESTORE POINTER
2011  011344  000750                        BR      DMRINB                  ;LOOK AT NEXT ENTRY
2012  011346  012602        DMRINX: MOV     (SP)+,R2                        ;RESTORE R2
2013  011350  012601                MOV     (SP)+,R1                        ;RESTORE R1
2014  011352  012600                MOV     (SP)+,R0                        ;RESTORE R0
2015  011354  042777  000200  167756        BIC     #,DONE,@DMCSR           ;CLEAR DONE FLAG
2016  011362  012767  000001  021524        MOV     #1,WATCOM
2017  011370  000002                        RTI
2018                                ;DM11 TAGS AND CORE TABLE
2019
2020          011400                        .=',1377+1                      ;SET ASSEMBLER LOCATION COUNTER
2021                                                                        ;TO X XXX XXX X00 000 000
2022
2023  011400  000000        DMCAT:  .       .                               ;RESERVE 16. WORDS FOR
2024          011440                        .=DMCAT+32'                     ;CURRENT ADDRESS TABLE
2025
2026  011440  000000        DMWCT:  .       .                               ;RESERVE 16. WORDS FOR
2027          011500                        .=DMWCT+32'                     ;WORD COUNT TABLE
2028
2029  011500  000000        DMBAT:  .       .                               ;RESERVE 16. WORDS FOR
2030          011540                        .=DMBAT+32'                     ;BIT ASSEMBLY TABLE
```



```
2031  011540  177400        DMMSK:  177400                                  ;CHARACTER MASK (8 BIT)
2032  011542  000000        DMTDAT: 0                                       ;BYTE COUNTER
2033  011544  000000        DMPTR:  0                                       ;SOFTWARE TUMBLE TABLE POINTER
2034  011546  177777        DMBARIM:-1                                      ;INITIALIXE TO TRANSMIT ALL LINES
2035          011600                        .=DMBAT+64'
2036
2037  011600  000000        TUMTAB: .                                       ;RESERVE 64. WORDS
2038          012000                        .=TUMTAB+128.                   ;FOR TUMBLE TABLE
2039
2040                                        ;EQUATES
2041
2042          000001                        .GO=1
2043          000004                        .MAINT=4
2044          000100                        .RIE=100
2045          000200                        .DONE=200
2046          010000                        .TIE=10000
2047          020000                        .OVRUN=20000
2048          040000                        .NEX=40000
2049          100000                        .READY=100000
2050          000240                        .DMPRTY=240
2051
2052                                .SBTTL  LINE PRINTER INTERRUPT SERVICE
2053
2054  012000  105777  167116        LPINTR: TSTB    @LPCSR                  ;TEST FOR FLAG
2055  012004  100401                        BMI     .+4
2056  012006  104000                        HLT                             ;FALSE RETURN FROM MAIN LINE
2057  012010  026727  000134  000117        CMP     CLINCT,#79.             ;TEST FOR END OF LINE
2058  012016  001415                        BEQ     LP4                     ;GO GENERATE CR/LF
2059  012020  005267  000124                INC     CLINCT                  ;INCREMENT LINE POSITION COUNT
2060  012024  026727  000114  000137        CMP     CURPAT,#137             ;TEST FOR MAXIMUM PATTERN
2061  012032  001403                        BEQ     LP3                     ;YES - GO TO LP3 AND RESET
2062  012034  005267  000104                INC     CURPAT                  ;NO - INCREMENT TO NEXT PATTERN
2063  012040  000435                        BR      LP2                     ;GO SEND IT TO LINE PRINTER
2064  012042  012767  000040  000074  LP3:  MOV     #40,CURPAT              ;RESET PATTERN AND SEND TO PRINTER
2065  012050  000431                        BR      LP2                     ;SENT TO LINE PRINTER
2066  012052  005067  000072        LP4:    CLR     CLINCT                  ;RESET LINE COUNT
2067  012056  012737  012074  000200        MOV     #LPIN2,@#200
2068  012064  012777  000012  167032        MOV     #12,@LPDBR              ;LINE FEED
2069  012072  000002                        RTI
2070  012074  012737  012000  000200  LPIN2: MOV     #LPINTR,@#200
2071  012102  026727  000040  000137        CMP     SOLPAT,#137             ;START OF LINE PATTERN
2072  012110  001403                        BEQ     LP5
2073  012112  005267  000030                INC     SOLPAT                  ;INCREMENT START OF LINE
2074  012116  000403                        BR      LP1
2075  012120  012767  000040  000020  LP5:  MOV     #40,SOLPAT              ;RESET START OF LINE
2076  012126  016767  000014  000010  LP1:  MOV     SOLPAT,CURPAT           ;START OF LINE TO CURRENT
2077  012134  016777  000004  166762  LP2:  MOV     CURPAT,@LPDBR           ;CURRENT PATTERN TO LINE PRINTER
2078  012142  000002                        RTI                             ;RETURN TO MAIN LINE
2079  012144  000000        CURPAT: 0                                       ;CURRENT CHARACTER BEING PRINTED
2080  012146  000000        SOLPAT: 0                                       ;START OF LINE CHARACTER
2081  012150  000000        CLINCT: 0                                       ;POSITION OF LINE
2082
2083                                .SBTTL  DECTAPE INTERRUPT SERVICE
2084
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```
 2085          000004                  RD=4                                    ;READ DATA
 2086          000014                  WD=14                                   ;WRITE DATA
 2087          000002                  RB=2
 2088          000002                  RR=2                                    ;READ BLOCK
 2089          000000                  F=0                                     ;FORWARD
 2090          000100                  IE=100                                  ;INTERRUPT ENABLE
 2091          000001                  DO=1                                    ;DO - THE FUNCTION
 2092          104000                  R=4000                                  ;REVERSE
 2093  *12152  000000                  TCFLAG: 0                               ;FLAG IS TESTED IN SCOPE
 2094  *12154  000000                  TCSTAT: 0                               ;DECTAPE PS
 2095
 2096  *12156  000000                  TCFIRST: 0                              ;FIRST BLOCK TO BE SEARCHED FOR
 2097  *12160  001171                  TCLAST: 577,                            ;LAST BLOCK TO BE SEARCHED FOR
 2098  *12162  000000                  TCEXPE: 0                               ;THE BLOCK THAT AS EXPECTED
 2099                                  ;GO TO FORWARD END ZONE
 2100  *12164  012767  012164  166022  TC11:   MOV     #TC11,TCIV              ;END ZONE VECTOR SETUP
 2101  *12172  005777  167052          TST     @TCST                           ;TEST FOR END ZONE
 2102  *12176  100403                  BMI     FEND1                           ;AT END ZONE?
 2103  *12200  105277  167042          INCB    @TCCM                           ;SET DO - NO DELAY
 2104  *12204  000002                  RTI                                     ;NO - WAIT SOME MORE
 2105  *12206  012767  012236  166000  FEND1:  MOV     #TCF1,TCIV              ;YES - NEW VECTOR
 2106  *12214  042777  104000  167024          BIC     #104000,@TCCM           ;SEARCH BLOCK FORWARD
 2107  *12222  016767  177730  177732          MOV     TCFIRST,TCEXPE          ;COUNT WHEN THIS BLOCK IS FOUND
 2108  *12230  105277  167012          TCF1A:  INCB    @TCCM                   ;SET DO
 2109  *12234  000002                  RTI                                     ;RETURN ON NEXT BLOCK
 2110  *12236                          TCF1:
 2111  *12236  032777  100200  167002          BIT     #100200,@TCCM           ;ANY ERROR ON READ?
 2112  *12244  100001                  BPL     .+4
 2113  *12246  104000                  HLT                                     ;TC ERROR SET - FORWARD READ BLOCK
 2114  *12250  001021                  BNE     .+4                             ;DONE FLAG UP?
 2115  *12252  104000                  HLT                                     ;FALSE INTERRUPT
 2116  *12254  027767  166772  177700          CMP     @TCDT,TCEXPE            ;IS THIS OUR BLOCK FOR SYNC
 2117  *12262  002762                  BLT     TCF1A                           ;NO-READ SOME MORE BLOCKS
 2118  *12264  001401                  BEQ     TCF2                            ;YES
 2119  *12266  104000                  HLT                                     ;WE PASSED THE BLOCK
 2120  *12270  012767  012304  165716  TCF2:   MOV     #TCF3,TCIV              ;VECTOR FOR SEQUENTIAL READS
 2121  *12276  105277  166744          INCB    @TCCM                           ;SET DO
 2122  *12302  000002                  RTI                                     ;RETURN AND TEST SEQUENTIAL BLOCKS
 2123
 2124                                  ;FIND SEQUENTIAL BLOCK AT FORWARD DIRECTION
 2125  *12304                          TCF3:
 2126  *12304  032777  100200  166734          BIT     #100200,@TCCM           ;TEST ERROR AND READY
 2127  *12312  100001                  BPL     .+4
 2128  *12314  104000                  HLT                                     ;FORWARD READ ERROR TC=11
 2129  *12316  001021                  BNE     .+4
 2130  *12320  104000                  HLT                                     ;FALSE INTERRUPT ON TC=11
 2131  *12322  027767  166724  177630          CMP     @TCDT,TCLAST            ;HAVE WE TESTED ALL BLOCKS
 2132  *12330  001414                  BEQ     REND2                           ;YES DRIVE UNIT IN END ZONE TO START OVER
 2133  *12332  005267  177624          INC     TCEXPE                          ;NO-INCREMENT EXPECTED COUNT
 2134  *12336  027767  166710  177616          CMP     @TCDT,TCEXPE            ;IS CURRENT BLOCK CORRECT
 2135  *12344  001401                  BEQ     .+4
 2136  *12346  104000                  HLT                                     ;FAILED IN FORWARD READ TO FIND NEXT BLOCK
 2137  *12350  000432                  BR      TCWBK                           ;THIS ROUTINE WRITES A BLOCK
 2138  *12352  105277  166670          TCF4:   INCB    @TCCM                   ;SET DO
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 2139  *12356  000002                  RTI
 2140  *12360  000721                  XTC11:  BR      TC11                    ;INDIRECT LINK
 2141
 2142                                  ;MOVE TAPE TO REVERSE END ZONE
 2143  *12362  012767  012362  165624  REND2:  MOV     #REND2,TCIV             ;END ZONE VECTOR SETUP
 2144  *12370  016767  177564  177564          MOV     TCLAST,TCEXPE           ;SET UP FOR REVERSE SEARCH
 2145  *12376  005777  166646          REND1:  TST     @TCST                   ;IN END ZONE
 2146  *12402  100403                  BMI     REND1                           ;YES - START TO TURN UNIT AROUND
 2147  *12404  105277  166636          REND:   INCB    @TCCM                   ;SET DO
 2148  *12410  000002                  RTI                                     ;NO - WAIT TILL WE ARE
 2149  *12412  016777  166642  166626  REND11: MOV     TCDRV,@TCCM             ;SELECT DRIVE TO BE TESTED
 2150  *12420  052777  004103  166620          BIS     #R+IE+RB+DO,@TCCM       ;FUNCTION = READ BLOCK, REVERSE AND GO
 2151  *12426  012767  012524  165560          MOV     #TCR1,TCIV              ;SET UP NEW INTERRUPT VECTOR
 2152  *12434  000002                  RTI
 2153
 2154                                  ;WRITE FORWARD ALL BLOCKS EXCEPT 0
 2155  *12436  012767  012470  165550  TCWBK:  MOV     #TCWB1,TCIV             ;INTERRUPT VECTOR FOR WRITE
 2156  *12444  012777  177400  166672          MOV     #-400,@TCWC             ;ONE BLOCK
 2157  *12452  012777  012750  166576          MOV     #TCWBUF,@TCBA           ;THE WRITE BUFFER ADDRESS
 2158  *12460  112777  000115  166560          MOVB    #IE+WD+DO,@TCCM         ;WRITE THE BLOCK
 2159  *12466  000002                  RTI                                     ;RETURN WHEN BLOCK IS WRITTEN
 2160  *12470  017767  166554  177456  TCWB11: MOV     @TCST,TCSTAT
 2161  *12476  005777  166544          TST     @TCCM                           ;ANY ERRORS
 2162  *12502  100001                  BPL     .+4
 2163  *12504  104000                  HLT
 2164  *12506  012767  012304  165570          MOV     #TCF3,TCIV              ;SEARCH BLOCK VECTOR
 2165  *12514  112777  000102  166524          MOVB    #IE+RB,@TCCM            ;READ BLOCK
 2166  *12522  000713                  BR      TCF4                            ;FIND THE NEXT BLOCK
 2167  *12524  017767  166520  177422  TCR1:   MOV     @TCST,TCSTAT
 2168  *12532  032777  100200  166506          BIT     #100200,@TCCM           ;TEST FOR ERROR AND READY
 2169  *12540  100001                  BPL     .+4
 2170  *12542  104000                  HLT                                     ;DECTAPE ERROR ON READ BLOCK REVERSE
 2171  *12544  001021                  BNE     .+4
 2172  *12546  104000                  HLT                                     ;FALSE INTERRUPT FROM DECTAPE
 2173  *12550  027767  166476  177404          CMP     @TCDT,TCEXPE            ;IS IT OUR FIRST BLOCK
 2174  *12556  001406                  BEQ     TCR2                            ;YES - GO TEST THE REST
 2175  *12560  002002                  BGE     TCR1A                           ;NO - HAVE WE PASSED THE BLOCK
 2176  *12562  104000                  HLT                                     ;WE PASS OUR BLOCK
 2177  *12564  000676                  BR      REND2                           ;GO TO END ZONE AND TRY AGAIN
 2178  *12566  105277  166454          TCR1A:  INCB    @TCCM                   ;SET DO
 2179  *12572  000002                  RTI                                     ;WE FOUND OUR FIRST BLOCK
 2180  *12574  012767  012610  165412  TCR2:   MOV     #TCR3,TCIV              ;SET UP INTERRUPT TO TEST ALL BLOCKS
 2181  *12602  105277  166440          INCB    @TCCM                           ;SET DO
 2182  *12606  000002                  RTI                                     ;WAIT FOR NEXT BLOCK TO INTERRUPT
 2183
 2184                                  ;FIND SEQUENTIAL BLOCK IN REVERSE DIRECTION
 2185  *12610                          TCR3:
 2186  *12610  032777  100200  166430          BIT     #100200,@TCCM           ;TEST FOR READ AND ERROR
 2187  *12616  100001                  BPL     .+4
 2188  *12620  104000                  HLT                                     ;ERROR READING SEQUENTIAL BLOCK IN REVERSE
 2189  *12622  001021                  BNE     .+4
 2190  *12624  104000                  HLT                                     ;FALSE DECTAPE INTERRUPT
 2191  *12626  026777  177324  166416          CMP     TCFIRST,@TCDT           ;DID WE DO ALL THE BLOCKS
 2192  *12634  001651                  BEQ     XTC11                           ;YES - GO TO END ZONE TO RESTART
```

```
2193  %12636  005367  177320          DEC     TCEXPE          ;NO = DECREMENT BLOCK NUMBER
2194  %12642  027767  166404  177312  CMP     #TCDT,TCEXPE    ;TEST SEQUENTIAL BLOCK IN REVERSE
2195  %12650  001401                  BEQ     .+4
2196  %12652  104000                  HLT                     ;TEST SEQUENTIAL READ BLOCK IN REVERSE FAILED
2197  %12654  000403                  BR      TCRBK
2198  %12656  105277  166364  TCR41  INCB    #TCCM           ;THIS ROUTINE READ A BLOCK
2199  %12662  000002                  RTI                     ;SET DO
2200                                                          ;LETS TRY A NEW BLOCK
2201                                  ;READ REVERSE ALL BLOCKS EXCEPT BLOCK 1101
2202  %12664  012767  012722  165322  TCR8K1  MOV     #TCRR1,TCIV     ;SET UP INTERRUPT VECTOR
2203  %12672  012777  177400  166354          MOV     #-400,@TCWC     ;READ ONE BLOCK
2204  %12700  012777  012750  166350          MOV     #TCRBUF,@TCBA   ;WHERE BUFFER IS
2205  %12706  112777  000105  166332          MOVB    #1E+PD+DO,@TCCM ;READ THE BLOCK
2206  %12714  005267  177232                  INC     TCFLAG          ;TESTED IN SCOPE ROUTINE
2207  %12720  000002                          RTI                     ;EXIT = RETURN WHEN BLOCK IS READ
2208  %12722                          TCR811
2209  %12722  005777  166320                  TST     @TCCM           ;AND ERRORS
2210  %12726  100001                  BPL     .+4
2211  %12730  104000                  HLT                     ;DECTAPE ERROR
2212  %12732  012767  012610  165254          MOV     #TCR3,TCIV      ;NEW VECTOR FOR BLOCK SEARCH
2213  %12740  112777  000102  166300          MOVB    #1E+RB,@TCCM    ;READ BLOCK FUNCTION
2214  %12746  000743                  BR      TCR4            ;RETURN TO BLOCK SEARCH
2215
2216                                  ;THIS WRITE BUFFER LOOKS THE SAME FORWARD OR REVERSE
2217  %12750                          TCWBUF:
2218  %12750                          TCRBUF:
2219  %12750  000001  177777                  1,-1
2220  %12754  000002  177776                  2,-2
2221  %12760  000003  177775                  3,-3
2222  %12764  000004  177774                  4,-4
2223  %12770  000005  177773                  5,-5
2224  %12774  000006  177772                  6,-6
2225  %13000  000007  177771                  7,-7
2226  %13004  000010  177770                  10,-10
2227  %13010  000011  177767                  11,-11
2228  %13014  000012  177766                  12,-12
2229  %13020  000013  177765                  13,-13
2230  %13024  000014  177764                  14,-14
2231  %13030  000015  177763                  15,-15
2232  %13034  000016  177762                  16,-16
2233  %13040  000017  177761                  17,-17
2234  %13044  000020  177760                  20,-20
2235  %13050  000021  177757                  21,-21
2236  %13054  000022  177756                  22,-22
2237  %13060  000023  177755                  23,-23
2238  %13064  000024  177754                  24,-24
2239  %13070  000025  177753                  25,-25
2240  %13074  000026  177752                  26,-26
2241  %13100  000027  177751                  27,-27
2242  %13104  000030  177750                  30,-30
2243  %13110  000031  177747                  31,-31
2244  %13114  000032  177746                  32,-32
2245  %13120  000033  177745                  33,-33
2246  %13124  000034  177744                  34,-34
```



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2247  %13130  000035  177743                  35,-35
2248  %13134  000036  177742                  36,-36
2249  %13140  000037  177741                  37,-37
2250  %13144  000040  177740                  40,-40
2251  %13150  000041  177737                  41,-41
2252  %13154  000042  177736                  42,-42
2253  %13160  000043  177735                  43,-43
2254  %13164  000044  177734                  44,-44
2255  %13170  000045  177733                  45,-45
2256  %13174  000046  177732                  46,-46
2257  %13200  000047  177731                  47,-47
2258  %13204  000050  177730                  50,-50
2259  %13210  000051  177727                  51,-51
2260  %13214  000052  177726                  52,-52
2261  %13220  000053  177725                  53,-53
2262  %13224  000054  177724                  54,-54
2263  %13230  000055  177723                  55,-55
2264  %13234  000056  177722                  56,-56
2265  %13240  000057  177721                  57,-57
2266  %13244  000060  177720                  60,-60
2267  %13250  000061  177717                  61,-61
2268  %13254  000062  177716                  62,-62
2269  %13260  000063  177715                  63,-63
2270  %13264  000064  177714                  64,-64
2271  %13270  000065  177713                  65,-65
2272  %13274  000066  177712                  66,-66
2273  %13300  000067  177711                  67,-67
2274  %13304  000070  177710                  70,-70
2275  %13310  000071  177707                  71,-71
2276  %13314  000072  177706                  72,-72
2277  %13320  000073  177705                  73,-73
2278  %13324  000074  177704                  74,-74
2279  %13330  000075  177703                  75,-75
2280  %13334  000076  177702                  76,-76
2281  %13340  000077  177701                  77,-77
2282  %13344  000100  177700                  100,-100
2283  %13350  177700  000100                  -100,100
2284  %13354  177701  000077                  -77,77
2285  %13360  177702  000076                  -76,76
2286  %13364  177703  000075                  -75,75
2287  %13370  177704  000074                  -74,74
2288  %13374  177705  000073                  -73,73
2289  %13400  177706  000072                  -72,72
2290  %13404  177707  000071                  -71,71
2291  %13410  177710  000070                  -70,70
2292  %13414  177711  000067                  -67,67
2293  %13420  177712  000066                  -66,66
2294  %13424  177713  000065                  -65,65
2295  %13430  177714  000064                  -64,64
2296  %13434  177715  000063                  -63,63
2297  %13440  177716  000062                  -62,62
2298  %13444  177717  000061                  -61,61
2299  %13450  177720  000060                  -60,60
2300  %13454  177721  000057                  -57,57
```

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2321  #13600  177746  000032                  =32,32
2322  #13604  177747  000031                  =31,31
2323  #13610  177750  000030                  =30,30
2324  #13614  177751  000027                  =27,27
2325  #13620  177752  000026                  =26,26
2326  #13624  177753  000025                  =25,25
2327  #13630  177754  000024                  =24,24
2328  #13634  177755  000023                  =23,23
2329  #13640  177756  000022                  =22,22
2330  #13644  177757  000021                  =21,21
2331  #13650  177760  000020                  =20,20
2332  #13654  177761  000017                  =17,17
2333  #13660  177762  000016                  =16,16
2334  #13664  177763  000015                  =15,15
2335  #13670  177764  000014                  =14,14
2336  #13674  177765  000013                  =13,13
2337  #13700  177766  000012                  =12,12
2338  #13704  177767  000011                  =11,11
2339  #13710  177770  000010                  =10,10
2340  #13714  177771  000007                  =7,7
2341  #13720  177772  000006                  =6,6
2342  #13724  177773  000005                  =5,5
2343  #13730  177774  000004                  =4,4
2344  #13734  177775  000003                  =3,3
2345  #13740  177776  000002                  =2,2
2346  #13744  177777  000001                  =1,1
2347
2348                                  .SBTTL  BUS TESTER SECTION 1 INTERRUPT SERVICE
2349
2350                                  ;DEVICE ONE NPR,DATIP,DATO,INTSP, DLY=1 MS
2351  #13750  005777  165524          BUST1:  TST     @ABCSR                  ;TEST FOR BUSY DOWN
2352  #13754  100001                          BPL     .+4
2353  #13756  104000                          HLT                             ;BUSY NOT DOWN
2354  #13760  026767  000072  000072          CMP     REC1A,EXP1A             ;TRANSFER DONE CORRECTLY
```



```
2355  #13766  001401                          BEQ     .+4
2356  #13770  104000                          HLT                             ;DATIP - DATO ERROR
2357  #13772  005267  000056                  INC     SEND1A                  ;NEW DATA SENT
2358  #13776  016767  000052  000052          MOV     SEND1A,REC1A
2359  #14004  016767  000044  000046          MOV     SEND1A,EXP1A            ;SET UP DATA
2360  #14012  006367  000042                  ASL     EXP1A                   ;EXPECTED BACK
2361  #14016  012777  000002  165452          MOV     #2,@ABWC                ;SET UP TESTER
2362  #14024  012777  014056  165442          MOV     #REC1A,@ABCA
2363  #14032  005077  165442                  CLR     @ABCSR
2364  #14036  012777  045511  165434          MOV     #45511,@ABCSR           ;LEVEL SIX
2365  #14044  012767  000001  016472          MOV     #1,WATCAR
2366  #14052  000002                          RTI
2367  #14054  000000                  SEND1A: 0                               ;SENT
2368  #14056  000000                  REC1A:  0                               ;RECEIVED
2369  #14060  000000                  EXP1A:  0                               ;EXPECTED
2370
2371                                  .SBTTL  BUS TESTER SECTION 2 INTERRUPT SERVICE
2372
2373                                  ;DEVICE TWO, INTR 7, DLY=100 US
2374  #14062  012767  000001  016470  BUST2:  MOV     #1,WATCBR
2375  #14070  000002                          RTI                             ;EXIT ON INTERRUPT
2376
2377                                  .SBTTL  BUS TESTER SECTION 3 INTERRUPT SERVICE
2378
2379                                  ;200 WORD TRANSFER USING THE BUS TESTER
2380                                  ;SECTION THREE A DELAYED
2381  #14072  005777  165432          CBUS1:  TST     @DBCSR
2382  #14076  100775                          BMI     CBUS1
2383  #14100  012777  000200  165410          MOV     #200,@CBWC              ;WORD COUNT
2384  #14106  012777  014240  165400          MOV     #CBBUF,@CBCA            ;CURRENT ADDRESS
2385  #14114  005077  165400                  CLR     @CBCSR
2386  #14120  052767  000040  163650          BIS     #40,PS                  ;RAISE PROCESSOR TO LEVEL 5
2387  #14126  012777  052615  165364          MOV     #52615,@CBCSR           ;NPR, DATO, P5
2388  #14134  012767  000001  016440          MOV     #1,WATCCR
2389  #14142  000002                          RTI                             ;RETURN TO MAIN LINE CODE
2390  #14144  005777  165350          BUST3:  TST     @CBCSR                  ;BUSY SHOULD BE DOWN
2391  #14150  100001                          BPL     .+4
2392  #14152  104000                          HLT                             ;FALSE INTERRUPT OR BUSY NOT DOWN
2393  #14154  012767  014240  000052          MOV     #CBBUF,CBCTA            ;BUFFER ADDRESS
2394  #14162  012767  000200  000046          MOV     #200,CBCTB              ;LENGTH OF BUFFER
2395  #14170  042767  000040  163600          BIC     #40,PS                  ;LOWER PRIORITY TO LEVEL 4
2396  #14176  027767  000032  000032  CBUS3:  CMP     @CBCTA,CBCTB            ;COMPARE THE DATA
2397  #14204  001401                          BEQ     .+4
2398  #14206  104000                          HLT                             ;DATA ERROR
2399  #14210  005177  000020                  COM     @CBCTA                  ;MIX UP OLD DATA
2400  #14214  062767  000002  000012          ADD     #2,CBCTA                ;BUFFER POSITION
2401  #14222  162767  000002  000006          SUB     #2,CBCTB                ;DATA COUNTER
2402  #14230  001720                          BEQ     CBUS1                   ;RESTART WHEN BC=0
2403  #14232  000761                          BR      CBUS3                   ;FINISH THE REST
2404  #14234  000000                  CBCTA:  0                               ;BUFFER POSITION
2405  #14236  000000                  CBCTB:  0                               ;DATA
2406  #14240  000000                  CBBUF:  0
2407          014240                  DBBUF=CBBUF
2408          014452                  .=.+210
```

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2409
2410                                        ;SBTTL  BUS TESTER SECTION 4 INTERRUPT SERVICE
2411                                        ;200 WORD TRANSFER USING THE BUS TESTER
2412                                        ;SECTION FOUR A NO DELAY
2413  014492  005777  165042          DBUS1:  TST     @CBCSR
2414  014496  100775                          BMI     DBUS1
2415  014498  012777  000200  165040          MOV     #200,@DBWC              ;WORD COUNT
2416  014506  012777  014240  165030          MOV     #DBBUF,@DBCA            ;CURRENT ADDRESS
2417  014514  005077  165030                  CLR     @DBCSR
2418  014520  012777  052645  165022          MOV     #52645,@DBCSR           ;NPR, DATO, P4
2419  014526  012767  000001  016172          MOV     #1,WATCDB
2420  014534  000002                          RTI                             ;RETURN TO MAIN LINE CODE
2421  014536  005777  165006          BUST4:  TST     @DBCSR                  ;BUSY SHOULD BE DOWN
2422  014542  100001                          BPL     .+4
2423  014544  104000                          HLT                             ;FALSE INTERRUPT OR BUSY NOT DOWN
2424  014546  000751                          BR      DBUS1                   ;NOP FOR COMPARE
2425  014550  012767  014240  000044          MOV     #DBBUF,DBCTA            ;LENGTH OF BUFFER
2426  014556  012767  000200  000040          MOV     #200,DBCTB              ;LENGTH OF BUFFER
2427  014564  027767  000032  000032  DBUS3:  CMP     @DBCTA,DBCTB            ;COMPARE THE DATA
2428  014572  001401                          BEQ     .+4
2429  014574  104000                          HLT                             ;DATA ERROR
2430  014576  005177  000020                  COM     @DBCTA                  ;MIX UP OLD DATA
2431  015002  062767  000002  000012          ADD     #2,DBCTA                ;BUFFER POSITION
2432  015010  162767  000002  000006          SUB     #2,DBCTB                ;DATA COUNTER
2433  015016  001725                          BEQ     DBUS1                   ;RESTART WHEN BC=0
2434  015020  000761                          BR      DBUS3                   ;FINISH THE REST
2435  015022  000000          DBCTA:  0                                       ;BUFFER POSITION
2436  015024  000000          DBCTB:  0                                       ;DATA
2437
```



```
2438                                        ;SBTTL  BASIC INSTRUCTION TEST
2439
2440  014606  012706  036520          PROCTS: MOV     #STACK,SP               ;SET UP STACK FOR CURRENT MODE
2441  014612  012767  014626  164244          MOV     #TEST0,RETURN           ;FOR SCOPING
2442  014620  012767  004000  164210          MOV     #4000,ICOUNT            ;ITERATION COUNT
2443
2444                                        ;SBTTL  TEST COMPARE INSTRUCTION INDEXED
2445
2446  014626  012700  177770          TEST0:  MOV     #-10,R0
2447  014632  026027  035002  125252          CMP     A(R0),#125252
2448  014640  001401                          BEQ     .+4
2449  014642  104000                          HLT
2450  014644  104400                          SCOPE
2451
2452  014646  012700  177770                  MOV     #-10,R0
2453  014652  022760  125252  035002          CMP     #125252,A(R0)
2454  014660  001401                          BEQ     .+4
2455  014662  104000                          HLT
2456  014664  104400                          SCOPE
2457
2458  014666  012700  000010                  MOV     #10,R0
2459  014672  026027  035002  052525          CMP     A(R0),#052525
2460  014700  001401                          BEQ     .+4
2461  014702  104000                          HLT
2462  014704  104400                          SCOPE
2463
2464  014706  012700  000010                  MOV     #10,R0
2465  014712  022760  052525  035002          CMP     #052525,A(R0)
2466  014720  001401                          BEQ     .+4
2467  014722  104000                          HLT
2468  014724  104400                          SCOPE
2469
2470  014726  012700  177770                  MOV     #-10,R0
2471  014732  026060  035002  035002          CMP     A(R0),A(R0)
2472  014740  001401                          BEQ     .+4
2473  014742  104000                          HLT
2474  014744  012700  000010                  MOV     #+10,R0
2475  014750  026060  035002  035002          CMP     A(R0),A(R0)
2476  014756  001401                          BEQ     .+4
2477  014760  104000                          HLT
2478  014762  104400                          SCOPE
2479
2480  014764  012700  177770                  MOV     #-10,R0
2481  014770  012701  000004                  MOV     #+4,R1
2482  014774  026061  035002  035002          CMP     A(R0),A(R1)
2483  015002  001401                          BEQ     .+4
2484  015004  104000                          HLT
2485  015006  104400                          SCOPE
2486
2487  015010  026160  035002  035002          CMP     A(R1),A(R0)
2488  015016  001401                          BEQ     .+4
2489  015020  104000                          HLT
2490  015022  104400                          SCOPE
2491  015024  012700  177774                  MOV     #-4,R0
```

```
2492  001030  012701  000010          MOV     #+10,R1
2493  001034  026061  035602  035672  CMP     A(R0),A(R1)
2494  001042  001401                  BEQ     .+4
2495  001044  104000                  HLT
2496  001046  104420                  SCOPE
2497  001050  012700  177774          MOV     #-4,R0
2498  001054  012701  000010          MOV     #10,R1
2499  001060  026160  035602  035672  CMP     A(R1),A(R0)
2500  001066  001401                  BEQ     .+4
2501  001070  104000                  HLT
2502  001072  104420                  SCOPE
2503
2504                                  .SBTTL  TEST MOVE INSTRUCTION FOR INDEX
2505
2506  001074  012700  177770          MOV     #-10,R0
2507  001100  016067  035602  020516  MOV     A(R0),TEMP
2508  001106  026727  020512  125252  CMP     TEMP,#125252
2509  001114  001401                  BEQ     .+4
2510  001116  104000                  HLT
2511  001120  104420                  SCOPE
2512
2513  001122  012700  000010          MOV     #+10,R0
2514  001126  016067  035602  020470  MOV     A(R0),TEMP
2515  001134  026727  020464  052525  CMP     TEMP,#052525
2516  001142  001401                  BEQ     .+4
2517  001144  104000                  HLT
2518  001146  104420                  SCOPE
2519
2520  001150  012700  177770          MOV     #-10,R0
2521  001154  012760  125252  035624  MOV     #125252,TEMP(R0)
2522  001162  026727  020426  125252  CMP     C,#125252
2523  001170  001401                  BEQ     .+4
2524  001172  104000                  HLT
2525  001174  104420                  SCOPE
2526
2527  001176  012700  000010          MOV     #+10,R0
2528  001202  012760  052525  035624  MOV     #052525,TEMP(R0)
2529  001210  026727  020420  052525  CMP     TEMP+10,#052525
2530  001216  001401                  BEQ     .+4
2531  001220  104000                  HLT
2532  001222  104420                  SCOPE
2533
2534                                  .SBTTL  TEST BIC INSTRUCTION FOR INDEXING
2535
2536  001224  012767  177777  020372  MOV     #-1,TEMP
2537  001232  042767  000000  020364  BIC     #0,TEMP
2538  001240  100401                  BMI     .+4
2539  001242  104000                  HLT
2540  001244  001001                  BNE     .+4
2541  001246  104000                  HLT
2542  001250  104420                  SCOPE
2543  001252  012767  177777  020344  MOV     #-1,TEMP
2544  001260  012700  177770          MOV     #-10,R0
2545  001264  046067  035602  020332  BIC     A(R0),TEMP
```



```
2546  001272  026727  020326  052525  CMP     TEMP,#052525
2547  001300  001401                  BEQ     .+4
2548  001302  104000                  HLT
2549  001304  104420                  SCOPE
2550
2551  001306  012767  177777  020310  MOV     #-1,TEMP
2552  001314  012700  000010          MOV     #10,R0
2553  001320  046067  035602  020276  BIC     A(R0),TEMP
2554  001326  026727  020272  125252  CMP     TEMP,#125252
2555  001334  001401                  BEQ     .+4
2556  001336  104000                  HLT
2557  001340  104420                  SCOPE
2558
2559  001342  012767  177777  020264  MOV     #-1,TEMP+10
2560  001350  012700  000010          MOV     #10,R0
2561  001354  042760  125252  035624  BIC     #125252,TEMP(R0)
2562  001362  026727  020246  052525  CMP     TEMP+10,#52525
2563  001370  001401                  BEQ     .+4
2564  001372  104000                  HLT
2565  001374  104420                  SCOPE
2566
2567  001376  012700  177770          MOV     #-10,R0
2568  001402  012767  177777  020264  MOV     #-1,TEMP-10
2569  001410  042767  052525  020176  BIC     #052525,TEMP-10
2570  001416  026727  020172  125252  CMP     TEMP-10,#125252
2571  001424  001401                  BEQ     .+4
2572  001426  104000                  HLT
2573  001430  104420                  SCOPE
2574
2575                                  .SBTTL  TEST SUBTRACT INSTRUCTION FOR INDEXING
2576
2577  001432  012767  125252  020164  MOV     #125252,TEMP
2578  001440  012700  177770          MOV     #-10,R0
2579  001444  166067  035602  020152  SUB     A(R0),TEMP
2580  001452  001401                  BEQ     .+4
2581  001454  104000                  HLT
2582  001456  104420                  SCOPE
2583
2584  001460  012767  125252  020136  MOV     #125252,TEMP
2585  001466  012700  177770          MOV     #-10,R0
2586  001472  166760  020074  035634  SUB     C,TEMP+10(R0)
2587  001500  001401                  BEQ     .+4
2588  001502  104000                  HLT
2589  001504  104420                  SCOPE
2590  001506  012767  052525  020110  MOV     #052525,TEMP
2591  001514  012700  000010          MOV     #10,R0
2592  001520  166067  035602  020076  SUB     A(R0),TEMP
2593  001526  001401                  BEQ     .+4
2594  001530  104000                  HLT
2595  001532  104420                  SCOPE
2596  001534  012767  052525  020062  MOV     #052525,TEMP
2597  001542  012700  000010          MOV     #10,R0
2598  001546  166760  020040  035614  SUB     A+10,C(R0)
2599  001554  001401                  BEQ     .+4
```

```
2650  016556  104000                          HLT
2651  016560  104400                          SCOPE
2652
2653                                  .SBTTL  TEST UNARYS INDEXED
2654
2655  016562  012767  177777  020034          MOV     #-1,TEMP
2656  016570  012700  177770                  MOV     #-10,R0
2657  016574  005060  035634                  CLR     D(R0)
2658  016600  005767  020020                  TST     TEMP
2659  016604  001401                          BEQ     .+4
2660  016606  104000                          HLT
2661  016610  104400                          SCOPE
2662  016612  012767  177777  020004          MOV     #-1,TEMP
2663  016620  012700  000010                  MOV     #+10,R0
2664  016624  005060  035614                  CLR     C(R0)
2665  016630  005767  017770                  TST     TEMP
2666  016634  001401                          BEQ     .+4
2667  016636  104000                          HLT
2668  016640  104400                          SCOPE
2669  016642  012767  177777  017754          MOV     #-1,TEMP
2670  016650  012700  177770                  MOV     #-10,R0
2671  016654  005160  035634                  COM     D(R0)
2672  016660  005767  017740                  TST     TEMP
2673  016664  001401                          BEQ     .+4
2674  016666  104000                          HLT
2675  016670  104400                          SCOPE
2676  016672  012767  177777  017724          MOV     #-1,TEMP
2677  016700  012700  000010                  MOV     #10,R0
2678  016704  005160  035614                  COM     C(R0)
2679  016710  005767  017710                  TST     TEMP
2680  016714  001401                          BEQ     .+4
2681  016716  104000                          HLT
2682  016720  104400                          SCOPE
2683
2684  016722  012767  177777  017674          MOV     #-1,TEMP
2685  016730  012700  177770                  MOV     #-10,R0
2686  016734  005260  035634                  INC     D(R0)
2687  016740  005767  017660                  TST     TEMP
2688  016744  001401                          BEQ     .+4
2689  016746  104000                          HLT
2690  016750  104400                          SCOPE
2691  016752  012767  177777  017644          MOV     #-1,TEMP
2692  016760  012700  000010                  MOV     #+10,R0
2693  016764  005260  035614                  INC     C(R0)
2694  016770  005767  017630                  TST     TEMP
2695  016774  001401                          BEQ     .+4
2696  016776  104000                          HLT
2697  017000  104400                          SCOPE
2698  017002  012767  000001  017614          MOV     #1,TEMP
2699  017010  012700  177770                  MOV     #-10,R0
2700  017014  005360  035634                  DEC     D(R0)
2701  017020  005767  017600                  TST     TEMP
2702  017024  001401                          BEQ     .+4
2703  017026  104000                          HLT
```



```
2704  017030  104400                          SCOPE
2705  017032  012767  000001  017564          MOV     #1,TEMP
2706  017040  012700  000010                  MOV     #10,R0
2707  017044  005360  035614                  DEC     C(R0)
2708  017050  005767  017550                  TST     TEMP
2709  017054  001401                          BEQ     .+4
2710  017056  104000                          HLT
2711  017060  104400                          SCOPE
2712  017062  012767  000001  017534          MOV     #1,TEMP
2713  017070  012700  177770                  MOV     #-10,R0
2714  017074  005460  035634                  NEG     D(R0)
2715  017100  022767  177777  017516          CMP     #-1,TEMP
2716  017106  001401                          BEQ     .+4
2717  017110  104000                          HLT
2718  017112  104400                          SCOPE
2719
2720  017114  012767  000001  017502          MOV     #1,TEMP
2721  017122  012700  000010                  MOV     #+10,R0
2722  017126  005460  035614                  NEG     C(R0)
2723  017132  022767  177777  017464          CMP     #-1,TEMP
2724  017140  001401                          BEQ     .+4
2725  017142  104000                          HLT
2726  017144  104400                          SCOPE
2727
2728  017146  012767  177777  017450          MOV     #-1,TEMP
2729  017154  012700  177770                  MOV     #-10,R0
2730  017160  000261                          SEC
2731  017162  005560  035634                  ADC     D(R0)
2732  017166  005767  017432                  TST     TEMP
2733  017172  001401                          BEQ     .+4
2734  017174  104000                          HLT
2735  017176  104400                          SCOPE
2736
2737  017200  012767  177777  017416          MOV     #-1,TEMP
2738  017206  012700  000010                  MOV     #+10,R0
2739  017212  000261                          SEC
2740  017214  005560  035614                  ADC     C(R0)
2741  017220  005767  017400                  TST     TEMP
2742  017224  001401                          BEQ     .+4
2743  017226  104000                          HLT
2744  017230  104400                          SCOPE
2745
2746  017232  012767  000001  017364          MOV     #1,TEMP
2747  017240  012700  177770                  MOV     #-10,R0
2748  017244  000261                          SEC
2749  017246  005660  035634                  SBC     D(R0)
2750  017252  005767  017346                  TST     TEMP
2751  017256  001401                          BEQ     .+4
2752  017260  104000                          HLT
2753  017262  104400                          SCOPE
2754
2755  017264  012767  000001  017332          MOV     #1,TEMP
2756  017272  012700  000010                  MOV     #+10,R0
2757  017276  000261                          SEC
```

```
2708  ?16300  ?05600  ?35614          SBC     @(R0)
2709  ?16304  ?05767  ?17314          TST     TEMP
2710  ?16310  ?01401                  BEQ     .+4
2711  ?16312  104000                  HLT
2712  ?16314  104400                  SCOPE
2713
2714                                  .SBTTL  TEST JMP INDEXED
2715
2716  ?16316  ?12700  ?00010          MOV     #.+10,R0
2717  ?16322  ?00160  ?16316          JMP     RJMP1-10(R0)
2718  ?16326  ?00240                  RJMP1:  NOP
2719  ?16330  104400                  SCOPE
2720
2721  ?16332  ?12700  177770          MOV     #-10,R0
2722  ?16336  ?00160  ?16354          JMP     RJMP2+10(R0)
2723  ?16342  104000                  HLT
2724  ?16344  ?00240                  RJMP2:  NOP
2725  ?16346  104400                  SCOPE
2726
2727                                  .SBTTL  TEST COMPARE INSTRUCTION
2728
2729  ?16350  ?23727  ?35572  125252  CMP     @#8,#125252
2730  ?16356  ?01401                  BEQ     .+4
2731  ?16360  104000                  HLT
2732  ?16362  104400                  SCOPE
2733
2734  ?16364  ?22737  125252  ?35572  CMP     #125252,@#8
2735  ?16372  ?01401                  BEQ     .+4
2736  ?16374  104000                  HLT
2737  ?16376  104400                  SCOPE
2738
2739  ?16400  ?23737  ?35572  ?35572  CMP     @#8,@#8
2740  ?16406  ?01401                  BEQ     .+4
2741  ?16410  104000                  HLT
2742  ?16412  104400                  SCOPE
2743
2744
2745                                  .SBTTL  TEST MOVE INSTRUCTIONS
2746
2747  ?16414  ?13700  ?35572          MOV     @#8,R0
2748  ?16420  ?22700  125252          CMP     #125252,R0
2749  ?16424  ?01401                  BEQ     .+4
2750  ?16426  104000                  HLT
2751  ?16430  104400                  SCOPE
2752
2753  ?16432  ?12737  125252  ?35624  MOV     #125252,@#TEMP
2754  ?16440  ?26767  ?17126  ?17156  CMP     8,TEMP
2755  ?16446  ?01401                  BEQ     .+4
2756  ?16450  104000                  HLT
2757  ?16452  104400                  SCOPE
2758
2759  ?16454  ?13737  ?35572  ?35614  MOV     @#8,@#C
2760  ?16462  ?26767  ?17104  ?17124  CMP     8,C
2761  ?16470  ?01401                  BEQ     .+4
```



```
2762  ?16472  104000                  HLT
2763  ?16474  104400                  SCOPE
2764
2765                                  .SBTTL  TEST BIC INSTRUCTION INDIRECT
2766
2767  ?16476  ?12700  177777          MOV     #-1,R0
2768  ?16502  ?43700  ?35572          BIC     @#8,R0
2769  ?16506  ?20027  ?52525          CMP     R0,#?52525
2770  ?16512  ?01401                  BEQ     .+4
2771  ?16514  104000                  HLT
2772  ?16516  104400                  SCOPE
2773
2774  ?16520  ?12767  177777  ?17076  MOV     #-1,TEMP
2775  ?16526  ?42737  125252  ?35624  BIC     #125252,@#TEMP
2776  ?16534  ?22767  ?52525  ?17062  CMP     #052525,TEMP
2777  ?16542  ?01401                  BEQ     .+4
2778  ?16544  104000                  HLT
2779  ?16546  104400                  SCOPE
2780
2781  ?16550  ?12767  177777  ?17036  MOV     #-1,C
2782  ?16556  ?43737  ?35572  ?35614  BIC     @#8,@#C
2783  ?16564  ?26727  ?17024  ?52525  CMP     C,#52525
2784  ?16572  ?01401                  BEQ     .+4
2785  ?16574  104000                  HLT
2786  ?16576  104400                  SCOPE
2787
2788                                  .SBTTL  TEST SUBTRACT INSTRUCTION
2789
2790  ?16600  ?12700  125252          MOV     #125252,R0
2791  ?16604  163700  ?35572          SUB     @#8,R0
2792  ?16610  ?20027  ?00000          CMP     R0,#?
2793  ?16614  ?01401                  BEQ     .+4
2794  ?16616  104000                  HLT
2795  ?16620  104400                  SCOPE
2796
2797  ?16622  ?12767  125252  ?16774  MOV     #125252,TEMP
2798  ?16630  166737  ?16736  ?35624  SUB     8,@#TEMP
2799  ?16636  ?01401                  BEQ     .+4
2800  ?16640  104000                  HLT
2801  ?16642  104400                  SCOPE
2802
2803  ?16644  ?12767  125252  ?16752  MOV     #125252,TEMP
2804  ?16652  163767  ?35572  ?16744  SUB     @#8,TEMP
2805  ?16660  ?05767  ?16740          TST     TEMP
2806  ?16664  ?01401                  BEQ     .+4
2807  ?16666  104000                  HLT
2808  ?16672  104400                  SCOPE
2809
2810                                  .SBTTL  TEST ADD INDIRECT
2811
2812  ?16672  ?05000                  CLR     R0
2813  ?16674  ?63700  ?35572          ADD     @#8,R0
2814  ?16700  ?22700  125252          CMP     #125252,R0
2815  ?16704  ?01401                  BEQ     .+4
```

```
2816  016706  104000                          HLT
2817  016710  104400                          SCOPE
2818
2819  016712  005067  016706                  CLR     TEMP
2820  016716  062737  125252  035624          ADD     #125252,@#TEMP
2821  016724  022767  125252  016672          CMP     #125252,TEMP
2822  016732  001401                          BEQ     .+4
2823  016734  104000                          HLT
2824
2825  016736  012767  125252  016660          MOV     #125252,TEMP
2826  016744  067737  016640  035624          ADD     @A+6,@#TEMP
2827  016752  026727  016646  177777          CMP     TEMP,#-1
2828  016760  001401                          BEQ     .+4
2829  016762  104000                          HLT
2830  016764  104400                          SCOPE
2831
2832                                  .SBTTL  TEST UNARYS INDIRECT
2833
2834  016766  012767  177777  016630          MOV     #-1,TEMP
2835  016774  005037  035624                  CLR     @#TEMP
2836  017000  005767  016620                  TST     TEMP
2837  017004  001401                          BEQ     .+4
2838  017006  104000                          HLT
2839  017010  104400                          SCOPE
2840
2841  017012  012767  125252  016604          MOV     #125252,TEMP
2842  017020  005137  035624                  COM     @#TEMP
2843  017024  022767  052525  016572          CMP     #052525,TEMP
2844  017032  001401                          BEQ     .+4
2845  017034  104000                          HLT
2846  017036  104400                          SCOPE
2847
2848  017040  005067  016560                  CLR     TEMP
2849  017044  005237  035624                  INC     @#TEMP
2850  017050  022767  000001  016546          CMP     #1,TEMP
2851  017056  001401                          BEQ     .+4
2852  017060  104000                          HLT
2853  017062  104400                          SCOPE
2854
2855  017064  005067  016534                  CLR     TEMP
2856  017070  005377  016532                  DEC     @TEMP+2
2857  017074  026727  016524  177777          CMP     TEMP,#-1
2858  017102  001401                          BEQ     .+4
2859  017104  104000                          HLT
2860  017106  104400                          SCOPE
2861
2862  017110  012767  000001  016526          MOV     #1,TEMP
2863  017116  005437  035624                  NEG     @#TEMP
2864  017122  022767  177777  016474          CMP     #-1,TEMP
2865  017130  001401                          BEQ     .+4
2866  017132  104000                          HLT
2867  017134  104400                          SCOPE
2868
2869                                  .SBTTL  TEST COMPARE INSTRUCTION INDEXED AND INDIRECT
```



```
2870
2871  017136  027727  016432  125252          CMP     @B+2,#125252
2872  017144  001401                          BEQ     .+4
2873  017146  104000                          HLT
2874  017150  104400                          SCOPE
2875
2876  017152  022777  125252  016414          CMP     #125252,@B+2
2877  017160  001401                          BEQ     .+4
2878  017162  104000                          HLT
2879  017164  104400                          SCOPE
2880
2881  017166  027777  016402  016400          CMP     @B+2,@B+2
2882  017174  001401                          BEQ     .+4
2883  017176  104000                          HLT
2884  017200  104400                          SCOPE
2885
2886                                  .SBTTL  TEST MOVE INSTRUCTIONS INDEXED AND INDIRECT
2887
2888  017202  117700  016366                  MOV     @B+2,R0
2889  017206  022700  125252                  CMP     #125252,R0
2890  017212  001401                          BEQ     .+4
2891  017214  104000                          HLT
2892  017216  104400                          SCOPE
2893
2894  017220  012777  125252  016400          MOV     #125252,@TEMP+2
2895  017226  026767  016340  016370          CMP     B,TEMP
2896  017234  001401                          BEQ     .+4
2897  017236  104000                          HLT
2898  017240  104400                          SCOPE
2899
2900  017242  017777  016326  016346          MOV     @B+2,@C+2
2901  017250  026767  016316  016336          CMP     B,C
2902  017256  001401                          BEQ     .+4
2903  017260  104000                          HLT
2904  017262  104400                          SCOPE
2905
2906                                  .SBTTL  TEST BIC INSTRUCTION, INDEXED AND INDIRECT
2907
2908  017264  012700  177777                  MOV     #-1,R0
2909  017270  047700  016300                  BIC     @B+2,R0
2910  017274  020027  052525                  CMP     R0,#52525
2911  017300  001401                          BEQ     .+4
2912  017302  104000                          HLT
2913  017304  104400                          SCOPE
2914
2915  017306  012767  177777  016310          MOV     #-1,TEMP
2916  017314  042777  125252  016304          BIC     #125252,@TEMP+2
2917  017322  022767  052525  016274          CMP     #52525,TEMP
2918  017330  001401                          BEQ     .+4
2919  017332  104000                          HLT
2920  017334  104400                          SCOPE
2921
2922  017336  012767  177777  016250          MOV     #-1,C
2923  017344  047777  016224  016244          BIC     @B+2,@C+2
```

```
 2924  017352  026767  016234  016234          CMP     A+10,C
 2925  017360  001401                          BEQ     .+4
 2926  017362  104000                          HLT
 2927  017364  104420                          SCOPE
 2928
 2929  017366  012700  125252                  MOV     #125252,R0
 2930  017372  167700  016176                  SUB     @B+2,R0
 2931  017376  020027  000000                  CMP     R0,#0
 2932  017402  001401                          BEQ     .+4
 2933  017404  104000                          HLT
 2934  017406  104420                          SCOPE
 2935
 2936  017410  012767  125252  016276          MOV     #125252,TEMP
 2937  017416  166777  016150  016272          SUB     B,@TEMP+2
 2938  017424  001401                          BEQ     .+4
 2939  017426  104000                          HLT
 2940  017430  104420                          SCOPE
 2941
 2942  017432  012767  125252  016164          MOV     #125252,TEMP
 2943  017440  167777  016130  016160          SUB     @B+2,@TEMP+2
 2944  017446  005767  016152                  TST     TEMP
 2945  017452  001401                          BEQ     .+4
 2946  017454  104000                          HLT
 2947  017456  104420                          SCOPE
 2948
 2949                                  .SBTTL  TEST ADD INDIRECT WITH INDEXING
 2950
 2951  017460  005000                          CLR     R0
 2952  017462  067700  016136                  ADD     @B+2,R0
 2953  017466  022700  125252                  CMP     #125252,R0
 2954  017472  001401                          BEQ     .+4
 2955  017474  104000                          HLT
 2956  017476  104420                          SCOPE
 2957
 2958  017500  005067  016120                  CLR     TEMP
 2959  017504  062777  125252  016114          ADD     #125252,@TEMP+2
 2960  017512  022767  125252  016104          CMP     #125252,TEMP
 2961  017520  001401                          BEQ     .+4
 2962  017522  104000                          HLT
 2963
 2964  017524  012767  125252  016072          MOV     #125252,TEMP
 2965  017532  067777  016052  016066          ADD     @A+6,@TEMP+2
 2966  017540  026727  016060  177777          CMP     TEMP,#-1
 2967  017546  001401                          BEQ     .+4
 2968  017550  104000                          HLT
 2969  017552  104420                          SCOPE
 2970
 2971                                  .SBTTL  TEST UNARYS INDIRECT WITH INDEXING
 2972
 2973  017554  012767  177777  016042          MOV     #-1,TEMP
 2974  017562  005077  016040                  CLR     @TEMP+2
 2975  017566  005767  016032                  TST     TEMP
 2976  017572  001401                          BEQ     .+4
 2977  017574  104000                          HLT
```



```
 2978  017576  104420                          SCOPE
 2979
 2980  017600  012767  125252  016016          MOV     #125252,TEMP
 2981  017606  005177  016014                  COM     @TEMP+2
 2982  017612  022767  052525  016004          CMP     #052525,TEMP
 2983  017620  001401                          BEQ     .+4
 2984  017622  104000                          HLT
 2985  017624  104420                          SCOPE
 2986
 2987  017626  005067  015772                  CLR     TEMP
 2988  017632  005277  015770                  INC     @TEMP+2
 2989  017636  022767  000001  015762          CMP     #1,TEMP
 2990  017644  001401                          BEQ     .+4
 2991  017646  104000                          HLT
 2992  017650  104420                          SCOPE
 2993
 2994  017652  005067  015746                  CLR     TEMP
 2995  017656  005377  015744                  DEC     @TEMP+2
 2996  017662  026727  015736  177777          CMP     TEMP,#-1
 2997  017670  001401                          BEQ     .+4
 2998  017672  104000                          HLT
 2999  017674  104420                          SCOPE
 3000
 3001  017676  012767  000001  015722          MOV     #1,TEMP
 3002  017704  005477  015716                  NEG     @TEMP+2
 3003  017710  022767  177777  015706          CMP     #-1,TEMP
 3004  017716  001401                          BEQ     .+4
 3005  017720  104000                          HLT
 3006  017722  104420                          SCOPE
 3007
 3008  017724  012767  177777  015672          MOV     #-1,TEMP
 3009  017732  000261                          SEC
 3010  017734  005577  015666                  ADC     @TEMP+2
 3011  017740  005767  015660                  TST     TEMP
 3012  017744  001401                          BEQ     .+4
 3013  017746  104000                          HLT
 3014  017750  104420                          SCOPE
 3015
 3016  017752  012767  000001  015644          MOV     #1,TEMP
 3017  017760  000261                          SEC
 3018  017762  005677  015640                  SBC     @TEMP+2
 3019  017766  005767  015632                  TST     TEMP
 3020  017772  001401                          BEQ     .+4
 3021  017774  104000                          HLT
 3022  017776  104420                          SCOPE
 3023
 3024                                  .SBTTL  TEST OF COMBINED INDEXING AND INDIRECT
 3025
 3026  020000  012700  177772                  MOV     #-6,R0
 3027  020004  027027  035002  125252          CMP     @A(R0),#125252
 3028  020012  001401                          BEQ     .+4
 3029  020014  104000                          HLT
 3030  020016  104420                          SCOPE
 3031
```

```
 3032  020020  012700  177772          MOV     #-6,R0
 3033  020024  022770  125252  035602  CMP     #125252,@A(R0)
 3034  020032  001401                  BEQ     .+4
 3035  020034  104000                  HLT
 3036  020036  104420                  SCOPE
 3037
 3038  020040  012700  177772          MOV     #-6,R0
 3039  020044  012701  000002          MOV     #+2,R1
 3040  020050  027071  035602  035602  CMP     @A(R0),@A(R1)
 3041  020056  001401                  BEQ     .+4
 3042  020060  104000                  HLT
 3043  020062  104420                  SCOPE
 3044
 3045                                  .SBTTL  TEST BIC INSTRUCTION INDEXED AND INDIRECT
 3046
 3047  020064  012700  000006          MOV     #+6,R0
 3048  020070  012767  177777  015526  MOV     #-1,TEMP
 3049  020076  047067  035602  015520  BIC     @A(R0),TEMP
 3050  020104  022767  125252  015512  CMP     #125252,TEMP
 3051  020112  001401                  BEQ     .+4
 3052  020114  104000                  HLT
 3053  020116  104420                  SCOPE
 3054
 3055  020120  012700  177772          MOV     #-6,R0
 3056  020124  012767  177777  015462  MOV     #-1,C
 3057  020132  042770  125252  035624  BIC     #125252,@TEMP(R0)
 3058  020140  026727  015450  052525  CMP     C,#052525
 3059  020146  001401                  BEQ     .+4
 3060  020150  104000                  HLT
 3061  020152  104420                  SCOPE
 3062  020154  012767  177777  015432  MOV     #-1,C
 3063  020162  012700  177772          MOV     #-6,R0
 3064  020166  012701  177772          MOV     #-6,R1
 3065  020172  047071  035602  035624  BIC     @A(R0),@TEMP(R1)
 3066  020200  022767  052525  015406  CMP     #052525,C
 3067  020206  001401                  BEQ     .+4
 3068  020210  104000                  HLT
 3069  020212  104420                  SCOPE
 3070
 3071                                  .SBTTL  TEST COMPARE (BYTE) INSTRUCTION INDEXED
 3072
 3073  020214  012700  177770          MOV     #-10,R0
 3074  020220  126027  035602  000252  CMPB    A(R0),#000252
 3075  020226  001401                  BEQ     .+4
 3076  020230  104000                  HLT
 3077  020232  104420                  SCOPE
 3078
 3079  020234  012700  177770          MOV     #-10,R0
 3080  020240  122760  000252  035602  CMPB    #000252,A(R0)
 3081  020246  001401                  BEQ     .+4
 3082  020250  104000                  HLT
 3083  020252  104420                  SCOPE
 3084
 3085  020254  012700  000010          MOV     #10,R0
```



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 3086  020260  126027  035602  000125  CMPB    A(R0),#000125
 3087  020266  001401                  BEQ     .+4
 3088  020270  104000                  HLT
 3089  020272  104420                  SCOPE
 3090
 3091  020274  012700  000010          MOV     #10,R0
 3092  020300  122760  000125  035602  CMPB    #000125,A(R0)
 3093  020306  001401                  BEQ     .+4
 3094  020310  104000                  HLT
 3095  020312  104420                  SCOPE
 3096
 3097  020314  012700  177770          MOV     #-10,R0
 3098  020320  126060  035602  035602  CMPB    A(R0),A(R0)
 3099  020326  001401                  BEQ     .+4
 3100  020330  104000                  HLT
 3101  020332  104420                  SCOPE
 3102
 3103  020334  012700  000010          MOV     #+10,R0
 3104  020340  126060  035602  035602  CMPB    A(R0),A(R0)
 3105  020346  001401                  BEQ     .+4
 3106  020350  104000                  HLT
 3107  020352  104420                  SCOPE
 3108
 3109  020354  012700  177770          MOV     #-10,R0
 3110  020360  012701  000004          MOV     #+4,R1
 3111  020364  126061  035602  035602  CMPB    A(R0),A(R1)
 3112  020372  001401                  BEQ     .+4
 3113  020374  104000                  HLT
 3114  020376  104420                  SCOPE
 3115
 3116  020400  126160  035602  035602  CMPB    A(R1),A(R0)
 3117  020406  001401                  BEQ     .+4
 3118  020410  104000                  HLT
 3119  020412  104420                  SCOPE
 3120
 3121  020414  012700  177774          MOV     #-4,R0
 3122  020420  012701  000010          MOV     #+10,R1
 3123  020424  126061  035602  035602  CMPB    A(R0),A(R1)
 3124  020432  001401                  BEQ     .+4
 3125  020434  104000                  HLT
 3126
 3127  020436  012700  177774          MOV     #-4,R0
 3128  020442  012701  000010          MOV     #10,R1
 3129  020446  126160  035602  035602  CMPB    A(R1),A(R0)
 3130  020454  001401                  BEQ     .+4
 3131  020456  104000                  HLT
 3132  020460  104420                  SCOPE
 3133
 3134                                  .SBTTL  TEST MOVE (BYTE) INSTRUCTION FOR INDEX
 3135
 3136  020462  012700  177770          MOV     #-10,R0
 3137  020466  116067  035602  015130  MOVB    A(R0),TEMP
 3138  020474  126727  015124  000252  CMPB    TEMP,#000252
 3139  020502  001401                  BEQ     .+4
```

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 8140  020504  104000                          HLT
 8141  020506  104400                          SCOPE
 8142
 8143  020510  012700  000010                  MOV     #+10,R0
 8144  020514  116067  035602  015102          MOVB    A(R0),TEMP
 8145  020522  126727  015076  000125          CMPB    TEMP,#000125
 8146  020530  001401                          BEQ     .+4
 8147  020532  104000                          HLT
 8148  020534  104400                          SCOPE
 8149
 8150  020536  012700  177770                  MOV     #-10,R0
 8151  020542  112760  125252  035624          MOVB    #125252,TEMP(R0)
 8152  020550  126727  015040  125252          CMPB    C,#125252
 8153  020556  001401                          BEQ     .+4
 8154  020560  104000                          HLT
 8155  020562  104400                          SCOPE
 8156
 8157  020564  012700  000010                  MOV     #+10,R0
 8158  020570  112760  052525  035624          MOVB    #052525,TEMP(R0)
 8159  020576  126727  015032  052525          CMPB    TEMP+10,#052525
 8160  020604  001401                          BEQ     .+4
 8161  020606  104000                          HLT
 8162  020610  104400                          SCOPE
 8163
 8164                                  .SBTTL  TEST BIC (BYTE) INSTRUCTION FOR INDEXING
 8165
 8166  020612  012767  177777  015004          MOV     #-1,TEMP
 8167  020620  012700  177770                  MOV     #-10,R0
 8168  020624  146067  035602  014772          BICB    A(R0),TEMP
 8169  020632  126727  014766  177525          CMPB    TEMP,#177525
 8170  020640  001401                          BEQ     .+4
 8171  020642  104000                          HLT
 8172  020644  104400                          SCOPE
 8173
 8174  020646  012767  177777  014750          MOV     #-1,TEMP
 8175  020654  012700  000010                  MOV     #10,R0
 8176  020660  146067  035602  014736          BICB    A(R0),TEMP
 8177  020666  126727  014732  007652          CMPB    TEMP,#007652
 8178  020674  001401                          BEQ     .+4
 8179  020676  104000                          HLT
 8180  020700  104400                          SCOPE
 8181
 8182  020702  012767  177777  014724          MOV     #-1,TEMP+10
 8183  020710  012700  000010                  MOV     #10,R0
 8184  020714  142760  125252  035624          BICB    #125252,TEMP(R0)
 8185  020722  126727  014706  002525          CMPB    TEMP+10,#2525
 8186  020730  001401                          BEQ     .+4
 8187  020732  104000                          HLT
 8188  020734  104400                          SCOPE
 8189
 8190  020736  012700  177770                  MOV     #-10,R0
 8191  020742  012767  177777  014644          MOV     #-1,TEMP-10
 8192  020750  142767  052525  014636          BICB    #052525,TEMP-10
 8193  020756  126727  014632  125252          CMPB    TEMP-10,#125252
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 8194  020764  001401                          BEQ     .+4
 8195  020766  104000                          HLT
 8196  020770  104400                          SCOPE
 8197
 8198                                  .SBTTL  TEST UNARYS (BYTE) INDEXED
 8199
 8200  020772  012767  177777  014624          MOV     #-1,TEMP
 8201  021000  012700  177770                  MOV     #-10,R0
 8202  021004  105060  035634                  CLRB    D(R0)
 8203  021010  105767  014610                  TSTB    TEMP
 8204  021014  001401                          BEQ     .+4
 8205  021016  104000                          HLT
 8206  021020  104400                          SCOPE
 8207
 8208  021022  012767  177777  014574          MOV     #-1,TEMP
 8209  021030  012700  177770                  MOV     #-10,R0
 8210  021034  105060  035634                  CLRB    D(R0)
 8211  021040  026727  014560  177400          CMP     TEMP,#177400
 8212  021046  001401                          BEQ     .+4
 8213  021050  104000                          HLT
 8214  021052  104400                          SCOPE
 8215
 8216  021054  012767  177777  014542          MOV     #-1,TEMP
 8217  021062  012700  177771                  MOV     #-7,R0
 8218  021066  105060  035634                  CLRB    D(R0)
 8219  021072  026727  014526  000377          CMP     TEMP,#000377
 8220  021100  001401                          BEQ     .+4
 8221  021102  104000                          HLT
 8222  021104  104400                          SCOPE
 8223
 8224  021106  012767  177777  014510          MOV     #-1,TEMP
 8225  021114  012700  000010                  MOV     #+10,R0
 8226  021120  105060  035614                  CLRB    C(R0)
 8227  021124  105767  014474                  TSTB    TEMP
 8228  021130  001401                          BEQ     .+4
 8229  021132  104000                          HLT
 8230  021134  104400                          SCOPE
 8231
 8232  021136  012767  177777  014460          MOV     #-1,TEMP
 8233  021144  012700  177770                  MOV     #-10,R0
 8234  021150  105160  035634                  COMB    D(R0)
 8235  021154  105767  014444                  TSTB    TEMP
 8236  021160  001401                          BEQ     .+4
 8237  021162  104000                          HLT
 8238  021164  104400                          SCOPE
 8239
 8240  021166  012767  177777  014430          MOV     #-1,TEMP
 8241  021174  012700  000010                  MOV     #10,R0
 8242  021200  105160  035614                  COMB    C(R0)
 8243  021204  105767  014414                  TSTB    TEMP
 8244  021210  001401                          BEQ     .+4
 8245  021212  104000                          HLT
 8246  021214  104400                          SCOPE
 8247  021216  012767  177777  014400          MOV     #-1,TEMP
```

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3248  021224  012700  177770          MOV     #-10,R0
3249  021230  105200  035634          INCB    D(R0)
3250  021234  105767  014304          TSTB    TEMP
3251  021240  001401                  BEQ     .+4
3252  021242  104000                  HLT
3253  021244  026727  014354  177400  CMP     TEMP,#177400
3254  021252  001401                  BEQ     .+4
3255  021254  104000                  HLT
3256  021256  104400                  SCOPE
3257
3258  021260  012767  177777  014336  MOV     #-1,TEMP
3259  021266  012700  000010          MOV     #+10,R0
3260  021272  105200  035614          INCB    C(R0)
3261  021276  105767  014322          TSTB    TEMP
3262  021302  001401                  BEQ     .+4
3263  021304  104000                  HLT
3264  021306  104400                  SCOPE
3265
3266  021310  012767  000001  014306  MOV     #1,TEMP
3267  021316  012700  177770          MOV     #-10,R0
3268  021322  105300  035634          DECB    D(R0)
3269  021326  105767  014272          TSTB    TEMP
3270  021332  001401                  BEQ     .+4
3271  021334  104000                  HLT
3272  021336  104400                  SCOPE
3273
3274  021340  012767  000001  014256  MOV     #1,TEMP
3275  021346  012700  000010          MOV     #10,R0
3276  021352  105300  035614          DECB    C(R0)
3277  021356  105767  014242          TSTB    TEMP
3278  021362  001401                  BEQ     .+4
3279  021364  104000                  HLT
3280  021366  104400                  SCOPE
3281
3282  021370  012767  000001  014226  MOV     #1,TEMP
3283  021376  012700  177770          MOV     #-10,R0
3284  021402  105400  035634          NEGB    D(R0)
3285  021406  026727  014212  000377  CMP     TEMP,#377
3286  021414  001401                  BEQ     .+4
3287  021416  104000                  HLT
3288  021420  104400                  SCOPE
3289
3290  021422  012767  000001  014174  MOV     #1,TEMP
3291  021430  012700  000010          MOV     #+10,R0
3292  021434  105400  035614          NEGB    C(R0)
3293  021440  026727  014160  000377  CMP     TEMP,#377
3294  021446  001401                  BEQ     .+4
3295  021450  104000                  HLT
3296  021452  104400                  SCOPE
3297
3298  021454  012767  177777  014142  MOV     #-1,TEMP
3299  021462  012700  177770          MOV     #-10,R0
3300  021466  000261                  SEC
3301  021470  105560  035634          ADCB    D(R0)
```



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3302  021474  026727  014124  177400  CMP     TEMP,#177400
3303  021502  001401                  BEQ     .+4
3304  021504  104000                  HLT
3305  021506  104400                  SCOPE
3306
3307  021510  012767  177777  014106  MOV     #-1,TEMP
3308  021516  012700  000010          MOV     #+10,R0
3309  021522  000261                  SEC
3310  021524  105560  035614          ADCB    C(R0)
3311  021530  026727  014070  177400  CMP     TEMP,#177400
3312  021536  001401                  BEQ     .+4
3313  021540  104000                  HLT
3314  021542  104400                  SCOPE
3315
3316  021544  012767  000401  014052  MOV     #401,TEMP
3317  021552  012700  177771          MOV     #-7,R0
3318  021556  000261                  SEC
3319  021560  105600  035634          SBCB    D(R0)
3320  021564  022767  000001  014032  CMP     #1,TEMP
3321  021572  001401                  BEQ     .+4
3322  021574  104000                  HLT
3323  021576  104400                  SCOPE
3324
3325  021600  012767  000001  014016  MOV     #1,TEMP
3326  021606  012700  000010          MOV     #+10,R0
3327  021612  000261                  SEC
3328  021614  105660  035614          SBCB    C(R0)
3329  021620  005767  014000          TST     TEMP
3330  021624  001401                  BEQ     .+4
3331  021626  104000                  HLT
3332  021630  104400                  SCOPE
3333
3334                                  .SBTTL  TEST COMPARE (BYTE) INSTRUCTION INDIRECT
3335
3336  021632  123727  035572  000252  CMPB    @#B,#000252
3337  021640  001401                  BEQ     .+4
3338  021642  104000                  HLT
3339  021644  104400                  SCOPE
3340
3341  021646  123727  035573  000252  CMPB    @#B+1,#252
3342  021654  001401                  BEQ     .+4
3343  021656  104000                  HLT
3344  021660  104400                  SCOPE
3345
3346
3347  021662  122737  125252  035572  CMPB    #125252,@#B
3348  021670  001401                  BEQ     .+4
3349  021672  104000                  HLT
3350  021674  104400                  SCOPE
3351
3352  021676  123737  035572  035572  CMPB    @#B,@#B
3353  021704  001401                  BEQ     .+4
3354  021706  104000                  HLT
3355  021710  104400                  SCOPE
```

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 8356
 8357                                        .SBTTL  TEST MOVE (BYTE) INSTRUCTION INDIRECT
 8358
 8359  021712  113700  035572                      MOVB    @#B,R0
 8360  021716  122700  000252                      CMPB    #000252,R0
 8361  021722  001401                              BEQ     .+4
 8362  021724  104000                              HLT
 8363  021726  104400                              SCOPE
 8364
 8365  021730  112737  125252  035624              MOVB    #125252,@#TEMP
 8366  021736  126767  013630  013660              CMPB    B,TEMP
 8367  021744  001401                              BEQ     .+4
 8368  021746  104000                              HLT
 8369  021750  104400                              SCOPE
 8370
 8371  021752  113737  035572  035614              MOVB    @#B,@#C
 8372  021760  126767  013606  013626              CMPB    B,C
 8373  021766  001401                              BEQ     .+4
 8374  021770  104000                              HLT
 8375  021772  104400                              SCOPE
 8376
 8377                                        .SBTTL  TEST UNARY (BYTE) INSTRUCTIONS INDIRECT
 8378
 8379  021774  012767  177777  013622              MOV     #-1,TEMP
 8380  022002  105037  035624                      CLRB    @#TEMP
 8381  022006  026727  013612  177400              CMP     TEMP,#177400
 8382  022014  001401                              BEQ     .+4
 8383  022016  104000                              HLT
 8384  022020  104400                              SCOPE
 8385
 8386  022022  012767  125252  013574              MOV     #125252,TEMP
 8387  022030  105137  035624                      COMB    @#TEMP
 8388  022034  022767  125125  013562              CMP     #125125,TEMP
 8389  022042  001401                              BEQ     .+4
 8390  022044  104000                              HLT
 8391  022046  104400                              SCOPE
 8392
 8393  022050  012767  125252  013546              MOV     #125252,TEMP
 8394  022056  105137  035625                      COMB    @#TEMP+1
 8395  022062  022767  052652  013534              CMP     #052652,TEMP
 8396  022070  001401                              BEQ     .+4
 8397  022072  104000                              HLT
 8398  022074  104400                              SCOPE
 8399
 8400  022076  005067  013522                      CLR     TEMP
 8401  022102  105237  035625                      INCB    @#TEMP+1
 8402  022106  022767  000400  013510              CMP     #400,TEMP
 8403  022114  001401                              BEQ     .+4
 8404  022116  104000                              HLT
 8405  022120  104400                              SCOPE
 8406
 8407  022122  005067  013476                      CLR     TEMP
 8408  022126  105377  013474                      DECB    @TEMP+2
 8409  022132  026727  013466  000377              CMP     TEMP,#377
```



```
 8410  022140  001401                              BEQ     .+4
 8411  022142  104000                              HLT
 8412  022144  104400                              SCOPE
 8413
 8414  022146  005067  013452                      CLR     TEMP
 8415  022152  112767  000001  013445              MOVB    #1,TEMP+1
 8416  022160  105437  035625                      NEGB    @#TEMP+1
 8417  022164  022767  177400  013432              CMP     #177400,TEMP
 8418  022172  001401                              BEQ     .+4
 8419  022174  104000                              HLT
 8420  022176  104400                              SCOPE
 8421
 8422                                        .SBTTL  TEST COMPARE (BYTE) INSTRUCTION INDEXED AND INDIRECT
 8423
 8424  022200  127727  013370  125252              CMPB    @B+2,#125252
 8425  022206  001401                              BEQ     .+4
 8426  022210  104000                              HLT
 8427  022212  104400                              SCOPE
 8428
 8429  022214  122777  125252  013352              CMPB    #125252,@B+2
 8430  022222  001401                              BEQ     .+4
 8431  022224  104000                              HLT
 8432  022226  104400                              SCOPE
 8433
 8434  022230  127777  013340  013336              CMPB    @B+2,@B+2
 8435  022236  001401                              BEQ     .+4
 8436  022240  104000                              HLT
 8437  022242  104400                              SCOPE
 8438
 8439                                        .SBTTL  TEST MOVE (BYTE) INSTRUCTION INDEXED AND INDIRECT
 8440
 8441  022244  117700  013324                      MOVB    @B+2,R0
 8442  022250  122700  125252                      CMPB    #125252,R0
 8443  022254  001401                              BEQ     .+4
 8444  022256  104000                              HLT
 8445  022260  104400                              SCOPE
 8446
 8447  022262  112777  125252  013336              MOVB    #125252,@TEMP+2
 8448  022270  126767  013276  013326              CMPB    B,TEMP
 8449  022276  001401                              BEQ     .+4
 8450  022300  104000                              HLT
 8451  022302  104400                              SCOPE
 8452
 8453  022304  117777  013264  013304              MOVB    @B+2,@C+2
 8454  022312  126767  013254  013274              CMPB    B,C
 8455  022320  001401                              BEQ     .+4
 8456  022322  104000                              HLT
 8457  022324  104400                              SCOPE
 8458
 8459                                        .SBTTL  TEST BIC (BYTE) INSTRUCTION INDIRECT WITH INDEXING
 8460
 8461  022326  012700  177777                      MOV     #-1,R0
 8462  022332  147700  013236                      BICB    @B+2,R0
 8463  022336  120027  052525                      CMPB    R0,#52525
```

```
 3464  022342  001401                        BEQ     .+4
 3465  022344  104000                        HLT
 3466  022346  104400                        SCOPE
 3467
 3468  022350  012767  177777  013246        MOV     #-1,TEMP
 3469  022356  142777  125252  013242        BICB    #125252,@TEMP+2
 3470  022364  122767  052525  013232        CMPB    #52525,TEMP
 3471  022372  001401                        BEQ     .+4
 3472  022374  104000                        HLT
 3473  022376  104400                        SCOPE
 3474
 3475  022400  012767  177777  013206        MOV     #-1,C
 3476  022406  147777  013162  013202        BICB    @B+2,@C+2
 3477  022414  126767  013172  013172        CMPB    A+10,C
 3478  022422  001401                        BEQ     .+4
 3479  022424  104000                        HLT
 3480  022426  104400                        SCOPE
 3481
 3482                                  .SBTTL  TEST UNARYS (BYTE) INDIRECT WITH INDEXING
 3483
 3484  022430  012767  177777  013166        MOV     #-1,TEMP
 3485  022436  105077  013164                CLRB    @TEMP+2
 3486  022442  105767  013156                TSTB    TEMP
 3487  022446  001401                        BEQ     .+4
 3488  022450  104000                        HLT
 3489  022452  104400                        SCOPE
 3490
 3491  022454  012767  125252  013142        MOV     #125252,TEMP
 3492  022462  105177  013140                COMB    @TEMP+2
 3493  022466  122767  052525  013130        CMPB    #052525,TEMP
 3494  022474  001401                        BEQ     .+4
 3495  022476  104000                        HLT
 3496  022500  104400                        SCOPE
 3497
 3498  022502  005067  013116                CLR     TEMP
 3499  022506  105277  013114                INCB    @TEMP+2
 3500  022512  122767  000001  013104        CMPB    #1,TEMP
 3501  022520  001401                        BEQ     .+4
 3502  022522  104000                        HLT
 3503  022524  104400                        SCOPE
 3504
 3505  022526  005067  013072                CLR     TEMP
 3506  022532  105377  013070                DECB    @TEMP+2
 3507  022536  126727  013062  177777        CMPB    TEMP,#-1
 3508  022544  001401                        BEQ     .+4
 3509  022546  104000                        HLT
 3510  022550  104400                        SCOPE
 3511
 3512  022552  012767  000001  013044        MOV     #1,TEMP
 3513  022560  105477  013042                NEGB    @TEMP+2
 3514  022564  122767  177777  013032        CMPB    #-1,TEMP
 3515  022572  001401                        BEQ     .+4
 3516  022574  104000                        HLT
 3517  022576  104400                        SCOPE
```



```
 3518
 3519  022600  012767  177777  013016        MOV     #-1,TEMP
 3520  022606  000261                        SEC
 3521  022610  105577  013012                ADCB    @TEMP+2
 3522  022614  022767  177400  013002        CMP     #177400,TEMP
 3523  022622  001401                        BEQ     .+4
 3524  022624  104000                        HLT
 3525  022626  105767  012772                TSTB    TEMP
 3526  022632  001401                        BEQ     .+4
 3527  022634  104000                        HLT
 3528  022636  104400                        SCOPE
 3529
 3530  022640  012767  000001  012756        MOV     #1,TEMP
 3531  022646  000261                        SEC
 3532  022650  105377  012752                DECB    @TEMP+2
 3533  022654  005767  012744                TST     TEMP
 3534  022660  001401                        BEQ     .+4
 3535  022662  104000                        HLT
 3536  022664  104400                        SCOPE
 3537
 3538  022666  012700  177772                MOV     #-6,R0
 3539  022672  127027  035002  125252        CMPB    @A(R0),#125252
 3540  022700  001401                        BEQ     .+4
 3541  022702  104000                        HLT
 3542  022704  104400                        SCOPE
 3543
 3544  022706  012700  177772                MOV     #-6,R0
 3545  022712  122770  125252  035002        CMPB    #125252,@A(R0)
 3546  022720  001401                        BEQ     .+4
 3547  022722  104000                        HLT
 3548  022724  104400                        SCOPE
 3549
 3550  022726  012700  177772                MOV     #-6,R0
 3551  022732  012701  000002                MOV     #+2,R1
 3552  022736  127071  035002  035002        CMPB    @A(R0),@A(R1)
 3553  022744  001401                        BEQ     .+4
 3554  022746  104000                        HLT
 3555  022750  104400                        SCOPE
 3556
 3557  022752  012700  000006                MOV     #+6,R0
 3558  022756  012767  177777  012640        MOV     #-1,TEMP
 3559  022764  147067  035002  012632        BICB    @A(R0),TEMP
 3560  022772  122767  125252  012624        CMPB    #125252,TEMP
 3561  023000  001401                        BEQ     .+4
 3562  023002  104000                        HLT
 3563  023004  104400                        SCOPE
 3564
 3565  023006  012700  177772                MOV     #-6,R0
 3566  023012  012767  177777  012574        MOV     #-1,C
 3567  023020  142770  125252  035024        BICB    #125252,@TEMP(R0)
 3568  023026  126727  012562  000125        CMPB    C,#000125
 3569  023034  001401                        BEQ     .+4
 3570  023036  104000                        HLT
 3571  023040  104400                        SCOPE
```

```
8572
8573  023042  012700  035574          MOV     #B+2,R0
8574  023046  023067  012520          CMP     @(R0)+,B
8575  023052  001401                  BEQ     .+4
8576  023054  104000                  HLT
8577  023056  104400                  SCOPE
8578
8579  023060  012700  035576          MOV     #B+4,R0
8580  023064  025067  012502          CMP     @-(R0),B
8581  023070  001401                  BEQ     .+4
8582  023072  104000                  HLT
8583  023074  104400                  SCOPE
8584
8585  023076  012700  035576          MOV     #B+4,R0
8586  023102  125067  012464          CMPB    @-(R0),B
8587  023106  001401                  BEQ     .+4
8588  023110  104000                  HLT
8589  023112  104400                  SCOPE
8590
8591  023114  012700  035620          MOV     #C+4,R0
8592  023120  012767  177777  012466  MOV     #-1,C
8593  023126  105050                  CLRB    @-(R0)
8594  023130  026727  012460  177400  CMP     C,#177400
8595  023136  001401                  BEQ     .+4
8596  023140  104000                  HLT
8597  023142  104400                  SCOPE
8598
8599  023144  012767  177777  012442  MOV     #-1,C
8600  023152  012700  177772          MOV     #-6,R0
8601  023156  012701  177772          MOV     #-6,R1
8602  023162  149071  035602  035624  RICB    @A(R0),@TEMP(R1)
8603  023170  022767  177525  012416  CMP     #177525,C
8604  023176  001401                  BEQ     .+4
8605  023200  104000                  HLT
8606  023202  104400                  SCOPE
8607  023204  012700  052525          MOV     #52525,R0
8608  023210  104400                  SCOPE
8609
8610                                  .SBTTL  TEST JSR INSTRUCTION
8611
8612  023212  004767  000002          JSR     PC, TJSR2               ;PLACE PC ON STACK
8613  023216  000405          TJSR11  BR      TJSR3                   ;RETURN WERE ON RTS R19
8614  023220  021627  023216  TJSR21  CMP     @SP,#TJSR1              ;CHECK FOR CORRECT PC ON STACK
8615  023224  001401                  BEQ     .+4
8616  023226  104000                  HLT                             ;INCORRECT PC ON STACK
8617  023230  000207                  RTS     PC                      ;RETURN TO INST AFTER JSR
8618  023232  104400          TJSR31  SCOPE
8619
8620  023234  000257                  CCC
8621  023236  004717                  JSR     PC,@PC                  ;INSTRUCTION UNDER TEST
8622  023240  021627  023240          CMP     @SP,#.                  ;TEST THE STACK
8623  023244  001401                  BEQ     .+4
8624  023246  104000                  HLT                             ;PC OF JSR DID NOT GO TO STACK
8625  023250  005726                  TST     (SP)+                   ;REPOSITION THE STACK
```



```
8626  023252  104400                  SCOPE
8627
8628                                  .SBTTL  TEST NESTED SUBROUTINES
8629
8630  023254  000257                  CCC                             ;CLEAR CONDITION CODES
8631  023256  004767  012030          JSR     PC,SUBSPA
8632  023262  100401                  BMI     .+4
8633  023264  104000                  HLT                             ;JSR OR RTS FAILED
8634  023266  001401                  BEQ     .+4
8635  023270  104000                  HLT                             ;JSR OR RTS FAILED
8636  023272  102401                  BVS     .+4
8637  023274  104000                  HLT                             ;JSR OR RTS FAILED
8638  023276  103401                  BCS     .+4
8639  023300  104000                  HLT                             ;JSR OR RTS FAILED
8640  023302  104400                  SCOPE
8641
8642                                  .SBTTL  TEST ROTATE ODD BYTE
8643
8644  023304  104400                  SCOPE
8645  023306  000257                  CCC                             ;CLEAR "C"
8646  023310  012767  123456  012306  MOV     #123456,TEMP
8647  023316  106067  012303          RORB    TEMP+1                  ;ROTATE ODD BYTE
8648  023322  103401                  BCS     .+4
8649  023324  104000                  HLT                             ;C NOT SET
8650  023326  102401                  BVS     .+4
8651  023330  104000                  HLT                             ;V NOT SET
8652  023332  022767  051456  012264  CMP     #051456,TEMP
8653  023340  001401                  BEQ     .+4
8654  023342  104000                  HLT                             ;ROTATE FAILED
8655  023344  104400                  SCOPE
8656
8657  023346  000277                  SCC                             ;SET C
8658  023350  012767  123456  012246  MOV     #123456,TEMP
8659  023356  106067  012243          RORB    TEMP+1
8660  023362  103401                  BCS     .+4
8661  023364  104000                  HLT                             ;C NOT SET
8662  023366  102001                  BVC     .+4
8663  023370  104000                  HLT                             ;V NOT CLEARED
8664  023372  022767  151456  012224  CMP     #151456,TEMP
8665  023400  001401                  BEQ     .+4
8666  023402  104000                  HLT                             ;ROTATE FAILED
8667  023404  104400                  SCOPE
8668
8669  023406  000257                  CCC
8670  023410  012767  123456  012206  MOV     #123456,TEMP
8671  023416  106167  012203          ROLB    TEMP+1
8672  023422  103401                  BCS     .+4
8673  023424  104000                  HLT                             ;C NOT SET
8674  023426  102401                  BVS     .+4
8675  023430  104000                  HLT                             ;V NOT SET
8676  023432  022767  047056  012164  CMP     #047056,TEMP
8677  023440  001401                  BEQ     .+4
8678  023442  104000                  HLT                             ;ROTATE BYTE FAILED
8679  023444  104400                  SCOPE
```

```
3680
3681  023446  000277                        SCC                             ;SET C
3682  023450  012767  123456  012146        MOV     #123456,TEMP
3683  023456  106167  012143                ROLB    TEMP+1
3684  023462  103401                        BCS     .+4
3685  023464  104000                        HLT                             ;C NOT SET
3686  023466  102401                        BVS     .+4
3687  023470  104000                        HLT                             ;V NOT SET
3688  023472  022767  047456  012124        CMP     #047456,TEMP
3689  023500  001401                        BEQ     .+4
3690  023502  104000                        HLT                             ;ROTATE ODD BYTE FAILED
3691  023504  104400                        SCOPE
3692
3693  023506  000257                        CCC                             ;CLEAR C
3694  023510  012767  177777  012106        MOV     #-1,TEMP
3695  023516  106267  012103                ASRB    TEMP+1
3696  023522  103401                        BCS     .+4
3697  023524  104000                        HLT                             ;C NOT SET
3698  023526  102001                        BVC     .+4
3699  023530  104000                        HLT                             ;V NOT CLEARED
3700  023532  026727  012066  177777        CMP     TEMP,#-1
3701  023540  001401                        BEQ     .+4
3702  023542  104000                        HLT                             ;SHIFT FAILED
3703  023544  104400                        SCOPE
3704
3705  023546  000277                        SCC
3706  023550  012767  177777  012046        MOV     #-1,TEMP
3707  023556  106367  012043                ASLB    TEMP+1
3708  023562  103401                        BCS     .+4
3709  023564  104000                        HLT                             ;C NOT SET
3710  023566  102001                        BVC     .+4
3711  023570  104000                        HLT                             ;V NOT CLEARED
3712  023572  026727  012026  177377        CMP     TEMP,#177377
3713  023600  001401                        BEQ     .+4
3714  023602  104000                        HLT                             ;SHIFT BYTE FAILED
3715  023604  104400                        SCOPE
3716  023606  005067  155224                CLR     ICOUNT                  ;NO ITERATION
3717  023612  032767  004000  153750        BIT     #4000,SR
3718  023620  001402                        BEQ     COMPAR
3719  023622  000167  001200                JMP     TS45
3720
3721                                  .SBTTL  TEST ALL COMBINATIONS OF NUMBERS WITH COMPARE INSTRUCTION
3722
3723  023626  005003                COMPAR: CLR     R3                      ;INIT R3
3724  023630  005001                        CLR     R1                      ;INIT R1
3725  023632  020301                CMP1:   CMP     R3,R1                   ;ARE THE EQUAL
3726  023634  001401                        BEQ     .+4
3727  023636  104000                        HLT                             ;R3 AND R1 DID NOT COMPARE
3728  023640  020327  177777                CMP     R3,#-1                  ;AT UPPER LIMIT
3729  023644  001403                        BEQ     CMP2                    ;YES EXIT
3730  023646  005203                        INC     R3                      ;INCREMENT TO NEXT NUMBER
3731  023650  005201                        INC     R1
3732  023652  000767                        BR      CMP1
3733  023654  104400                CMP2:   SCOPE
```



```
3734  023656  000257                        CCC
3735  023660  012767  020001  011736        MOV     #20001,TEMP
3736  023666  006067  011732                ROR     TEMP
3737  023672  103401                        BCS     .+4
3738  023674  104000                        HLT
3739  023676  000257                        CCC
3740  023700  006167  011720                ROL     TEMP
3741  023704  022767  020000  011712        CMP     #20000,TEMP
3742  023712  001401                        BEQ     .+4
3743  023714  104000                        HLT
3744  023716  104400                        SCOPE
3745
3746                                  .SBTTL  TEST ROTATING ALL NUMBERS
3747
3748  023720  012767  023732  155136        MOV     #ROTALL,RETURN          ;SET UP SCOPE LOOP RETURN
3749  023726  005067  000124                CLR     REF                     ;CLEAR TEST DATA
3750  023732  016767  000120  000120  ROTALL: MOV     REFF,TEST
3751  023740  006067  000114                ROR     TEST
3752  023744  006067  000110                ROR     TEST
3753  023750  006067  000104                ROR     TEST
3754  023754  006167  000100                ROL     TEST
3755  023760  006167  000074                ROL     TEST
3756  023764  006167  000070                ROL     TEST
3757  023770  100074                        BPL     .+12
3758  023772  103037                        BCC     .+20                    ;Z=1
3759  023774  102013                        BVC     .+30                    ;Z=1, C=1
3760  023776  104000                        HLT                             ;Z=C, BUT V=1
3761  024000  000411                        BR      .+24
3762  024002  103036                        BCC     .+16                    ;Z=0
3763  024004  102407                        BVS     .+20                    ;Z=0, C=1
3764  024006  104000                        HLT                             ;Z NOT EQUAL C, V=1
3765  024010  000405                        BR      .+14
3766  024012  102404                        BVS     .+12                    ;Z=1, C=0
3767  024014  104000                        HLT                             ;Z NOT EQUAL C, V=1
3768  024016  000402                        BR      .+6
3769  024020  102001                        BVC     .+4                     ;Z=0, C=0
3770  024022  104000                        HLT                             ;Z=C, BUT V=1
3771  024024  026767  000030  000024        CMP     TEST,REFF
3772  024032  001401                        BEQ     .+4
3773  024034  104000                        HLT                             ;INITIAL NOT EQUAL TO STACKAL
3774  024036  104400                        SCOPE
3775  024040  012767  023732  155016        MOV     #ROTALL,RETURN
3776  024046  005267  000004                INC     REFF
3777  024052  001327                        BNE     ROTALL
3778  024054  000432                        BR      TSRT2A
3779  024056  000000                REFF:   0
3780  024060  000000                TEST:   0
3781          024056                        REFF=REFF
3782
3783                                  .SBTTL  TEST ROTATING BYTE EVEN/ODD, ALL NUMBERS
3784
3785  024062  005067  177770        TSRT2A: CLR     REFF
3786  024066  012767  024074  154772        MOV     #ROTBE,RETURN
3787  024074  016767  177756  177756  ROTBE:  MOV     REFF,TEST
```

```
 3788  024102  106067  177752                  RORB    TEST                    ;ROTATE BYTE EVEN
 3789  024106  106067  177746                  RORB    TEST
 3790  024112  106067  177742                  RORB    TEST
 3791  024116  106167  177736                  ROLB    TEST
 3792  024122  106167  177732                  ROLB    TEST
 3793  024126  106167  177726                  ROLB    TEST
 3794  024132  100004                          BPL     .+12
 3795  024134  103007                          BCC     .+20                    ;Z=1
 3796  024136  102013                          BVC     .+30                    ;Z=1, C=1
 3797  024140  104000                          HLT                             ;Z=C, BUT V=1
 3798  024142  000411                          BR      .+24
 3799  024144  103006                          BCC     .+16                    ;Z=0
 3800  024146  102407                          BVS     .+20                    ;Z=0, C=1
 3801  024150  104000                          HLT                             ;Z NOT EQUAL C, V=1
 3802  024152  000405                          BR      .+14
 3803  024154  102404                          BVS     .+12                    ;Z=1, C=0
 3804  024156  104000                          HLT                             ;Z NOT EQUAL C, V=1
 3805  024160  000402                          BR      .+6
 3806  024162  102001                          BVC     .+4                     ;Z=0, C=0
 3807  024164  104000                          HLT                             ;Z=C, BUT V=1
 3808  024166  026767  177666  177662          CMP     TEST,REFF
 3809  024174  001401                          BEQ     .+4
 3810  024176  104000                          HLT
 3811  024200  106067  177655          ROTB01  RORB    TEST+1                  ;ROTATE BYTE ODD
 3812  024204  106067  177651                  RORB    TEST+1
 3813  024210  106067  177645                  RORB    TEST+1
 3814  024214  106167  177641                  ROLB    TEST+1
 3815  024220  106167  177635                  ROLB    TEST+1
 3816  024224  106167  177631                  ROLB    TEST+1
 3817  024230  100004                          BPL     .+12
 3818  024232  103007                          BCC     .+20                    ;Z=1
 3819  024234  102013                          BVC     .+30                    ;Z=1, C=1
 3820  024236  104000                          HLT                             ;Z=C, BUT V=1
 3821  024240  000411                          BR      .+24
 3822  024242  103006                          BCC     .+16                    ;Z=0
 3823  024244  102407                          BVS     .+20                    ;Z=0, C=1
 3824  024246  104000                          HLT                             ;Z NOT EQUAL C, V=1
 3825  024250  000405                          BR      .+14
 3826  024252  102404                          BVS     .+12                    ;Z=1, C=0
 3827  024254  104000                          HLT                             ;Z NOT EQUAL C, V=1
 3828  024256  000402                          BR      .+6
 3829  024260  102001                          BVC     .+4                     ;Z=0, C=0
 3830  024262  104000                          HLT                             ;Z=C, BUT V=1
 3831  024264  026767  177570  177564          CMP     TEST,REFF
 3832  024272  001401                          BEQ     .+4
 3833  024274  104000                          HLT
 3834  024276  104400                  ROTEN1: SCOPE
 3835  024300  012767  024074  154556          MOV     #ROTBE,RETURN
 3836  024306  005267  177544                  INC     REF
 3837  024312  001270                          BNE     ROTBE
 3838
 3839                                  ;SBTTL  TEST ADD AND SUBTRACT ALL NUMBERS AGAINST FIXED NUMBERS
 3840
 3841                                  ;A+B=C, C-A=B, BF SHOULD EQUAL B!
```



```
 3842
 3843  024314  011667  000066          TSTAR1: MOV     @SP,NUMA
 3844  024320  012767  024332  154536          MOV     #ADSUB,RETURN
 3845  024326  005067  177524                  CLR     REFF
 3846  024332  016767  177520  177520  ADSUB1: MOV     REF,TEST
 3847  024340  066767  000042  177512          ADD     NUMA,TEST
 3848  024346  166767  000034  177504          SUB     NUMA,TEST
 3849  024354  026767  177476  177476          CMP     REF,TEST
 3850  024362  001401                          BEQ     .+4
 3851  024364  104000                          HLT
 3852  024366  104400                          SCOPE
 3853  024370  012767  024332  154466          MOV     #ADSUB,RETURN
 3854  024376  005267  177454                  INC     REFF
 3855  024402  001353                          BNE     ADSUB
 3856  024404  000402                          BR      TCOMA
 3857  024406  000000                  NUMA:   0
 3858  024410  104400                  ARTEND: SCOPE
 3859
 3860                                  ;SBTTL  TEST COMPLIMENTING ALL NUMBERS
 3861
 3862  024412  012767  024430  154444  TCOMA1  MOV     #TCOM,RETURN
 3863  024420  005067  011200                  CLR     TEMP                    ;BASE DATA
 3864  024424  005067  011200                  CLR     TEMP+4                  ;BASE REFERENCE
 3865  024430  005167  011170          TCOM1   COM     TEMP                    ;COMPLIMENT DATA
 3866  024434  005367  011170                  DEC     TEMP+4                  ;DECREMENT REFERENCE
 3867  024440  026767  011160  011162          CMP     TEMP,TEMP+4             ;COMPARE
 3868  024446  001401                          BEQ     .+4                     ;TEST
 3869  024450  104000                          HLT                             ;COMPLIMENT OR DECREMENT FAILED
 3870  024452  104400                          SCOPE
 3871  024454  012767  024430  154402          MOV     #TCOM,RETURN
 3872  024462  005167  011136                  COM     TEMP
 3873  024466  005267  011132                  INC     TEMP                    ;INCREMENT AND TEST FOR DONE
 3874  024472  001356                          BNE     TCOM                    ;NOT FINISHED GO LOOP
 3875
 3876                                  ;SBTTL  TEST COMB (EVEN BYTE)
 3877
 3878  024474  005067  011124                  CLR     TEMP                    ;BASE DATA
 3879  024500  005067  011124                  CLR     TEMP+4                  ;REFERENCE DATA
 3880  024504  012767  024512  154352          MOV     #TCOM2,RETURN
 3881  024512  105167  011106          TCOM21  COMB    TEMP
 3882  024516  005367  011106                  DEC     TEMP+4
 3883  024522  126767  011076  011100          CMPB    TEMP,TEMP+4             ;COMPARE
 3884  024530  001401                          BEQ     .+4
 3885  024532  104000                          HLT                             ;COMPLIMENT OR INCREMENT BYTE FAILED
 3886  024534  104400                          SCOPE
 3887  024536  012767  024512  154320          MOV     #TCOM2,RETURN
 3888  024544  105167  011054                  COMB    TEMP
 3889  024550  105267  011050                  INCB    TEMP
 3890  024554  001356                          BNE     TCOM2
 3891
 3892                                  ;SBTTL  TEST COMB (ODD BYTE)
 3893
 3894  024556  005067  011042                  CLR     TEMP                    ;BASE DATA
 3895  024562  005067  011042                  CLR     TEMP+4                  ;REFERENCE DATA
```

```
3896  024586  012767  024574  154270          MOV     #TCOM3,RETURN
3897  024574  105167  011025          TCOM31: COMB    TEMP+1                  ;ODD BYTE
3898  024600  005367  011024                  DEC     TEMP+4
3899  024604  126767  011015  011016          CMPB    TEMP+1,TEMP+4
3900  024612  001401                          BEQ     .+4
3901  024614  104000                          HLT                             ;COMPLEMENT BYTE FAILED
3902  024616  104420                          SCOPE
3903  024620  012767  024574  154236          MOV     #TCOM3,RETURN
3904  024626  105167  010775                  COMB    TEMP+1
3905  024632  105267  010767                  INCB    TEMP+1
3906  024636  001356                          BNE     TCOM3
3907  024640  012767  024646  154216          MOV     #TSCOM1,RETURN
3908
3909                                  ,SBTTL  TEST COMPARE ALL VALUE EVEN BYTE WITH ODD
3910
3911  024646  005067  010752          TSCOM1: CLR     TEMP                    ;BASE VALUE
3912  024652  126767  010746  010745  TSCOMB: CMPB    TEMP,TEMP+1             ;COMPARE
3913  024660  001401                          BEQ     .+4
3914  024662  104000                          HLT                             ;COMPARE FAILED
3915  024664  002001                          BGE     .+4
3916  024666  104000                          HLT                             ;V IS NOT = TO N
3917  024670  003401                          BLE     .+4
3918  024672  104000                          HLT                             ;V IS SET
3919  024674  062767  000401  010722          ADD     #401,TEMP
3920  024702  022767  177777  010714          CMP     #-1,TEMP
3921  024710  001350                          BNE     TSCOMB
3922  024712  104420                          SCOPE
3923
3924                                  ,SBTTL  TEST SWAB
3925
3926  024714  012767  000200  177136          MOV     #0200,TEST
3927  024722  000367  177132                  SWAB    TEST
3928  024726  100001                          BPL     .+4
3929  024730  104000                          HLT
3930  024732  001401                          BEQ     .+4
3931  024734  104000                          HLT
3932  024736  000367  177116                  SWAB    TEST
3933  024742  100401                          BMI     .+4
3934  024744  104000                          HLT
3935  024746  001001                          BNE     .+4
3936  024750  104000                          HLT
3937  024752  104420                          SCOPE
3938  024754  005037  001036                  CLR     @#ICOUNT
3939
3940                                  ,SBTTL  TEST ALL COMBINATIONS OF SWAB
3941
3942  024760  005067  177074                  CLR     TEST                    ;NUMBER UNDER TEST
3943  024764  005067  177066                  CLR     REF                     ;REFERENCE NUMBER
3944  024770  000367  177064          SWABA1: SWAB    TEST                    ;OPERATION UNDER TEST
3945  024774  026767  177062  177054          CMP     TEST,REF                ;TEST SWAB INSTRUCTION
3946  025002  001401                          BEQ     .+4
3947  025004  104000                          HLT                             ;SWAB FAILED
3948  025006  000367  177046                  SWAB    TEST
3949  025012  005267  177040                  INC     REF                     ;INCREMENT REFERENCE NUMBER
```



```
3950  025016  105267  177037                  INCB    TEST+1                  ;INC TEST NUMBER
3951  025022  001362                          BNE     SWABA                   ;LOOP TILL DONE
3952  025024  104420                          SCOPE
3953
3954  025026  032767  000002  154026  TS451:  BIT     #2,CONFIG               ;IF PROCESSOR IS NOT
3955  025034  001002                          BNE     XOR1                    ;PDP-11/40 OR 45
3956  025036  000167  002522                  JMP     ENDPRO                  ;EXIT PROCESSOR TEST
3957
3958                                  ,SBTTL  PDP-11/40,45 INSTRUCTION TESTS
3959
3960                                  ,SBTTL  TEST XOR INSTRUCTION
3961
3962  025042  012702  000010          XOR1:   MOV     #10,R2                  ;SET UP INDEX REGISTER
3963  025046  012701  052525                  MOV     #52525,R1               ;LOAD SOURCE OPERAND
3964  025052  012767  177777  010544          MOV     #-1,TEMP                ;LOAD DESTINATION OPERAND
3965  025060  074142  035614                  XOR     R1,C(R2)                ;XOR SOURCE,DEST,
3966  025064  022767  125252  010532          CMP     #125252,TEMP
3967  025072  001401                          BEQ     .+4
3968  025074  104000                          HLT
3969  025076  104420                          SCOPE
3970
3971                                  ,SBTTL  TEST XOR USING INDEX DEFERRED
3972
3973  025100  012701  125252                  MOV     #125252,R1              ;LOAD SOURCE OPERAND
3974  025104  012702  000010                  MOV     #10,R2                  ;LOAD INDEX REGISTER
3975  025110  012767  035624  010476          MOV     #TEMP,C                 ;SET UP DEFERRED ADDRESS
3976  025116  012767  035634  010472          MOV     #D,TEMP                 ;SET UP FINAL ADDRESS (D)
3977  025124  012767  177777  010462          MOV     #-1,D                   ;LOAD DESTINATION OPERAND
3978  025132  074172  035614                  XOR     R1,@C(R2)
3979  025136  022767  052525  010470          CMP     #52525,D                ;CORRECT RESULT?
3980  025144  001401                          BEQ     .+4
3981  025146  104000                          HLT                             ;XOR -1,125252 FAILED
3982  025150  104420                          SCOPE
3983
3984                                  ,SBTTL  TEST SOB FOR BRANCH
3985
3986  025152  000401                          BR      SOB1
3987  025154  000474          SOB2:   BR      SOB3
3988  025156  012701  000010          SOB1:   MOV     #10,R1
3989  025162  077124                          SOB     R1,SOB2
3990  025164  104000                          HLT                             ;SOB SHOULD HAVE BRANCHED
3991  025166  104420          SOB3:   SCOPE
3992
3993                                  ,SBTTL  TEST SOB FOR NO BRANCH
3994
3995  025170  000402                          BR      SOB4
3996  025172  104000          SOB5:   HLT                             ;SOB SHOULD NOT HAVE BRANCHED
3997  025174  000403                          BR      SOB6
3998  025176  012701  000001          SOB4:   MOV     #1,R1
3999  025202  077105                          SOB     R1,SOB5
4000  025204  104420          SOB6:   SCOPE
4001
4002
4003                                  ,SBTTL  TEST MARK INSTRUCTION
```

```
4004
4005  *25206  012706  036520              MOV     #STACK,SP          ;INITIALIZE STACK POINTER
4006  *25212  005001                       CLR     R1
4007  *25214  012746  000007              MOV     #7,-(SP)
4008  *25220  012746  000001              MOV     #1,-(SP)           ;PUSH A PARAMETER ON THE STACK
4009  *25224  012746  006401              MOV     #MARK1,-(SP)       ;PUSH MARK1 ON THE STACK
4010  *25230  010605                       MOV     SP,R5              ;LOAD PARAMETER POINTER
4011  *25232  004767  000002              JSR     PC,MARK0           ;GO TO SUBROUTINE
4012  *25236  000403                       BR      MARK2A
4013  *25240  016501  000002      MARK2I  MOV     2(R5),R1           ;GET THE PARAMETER
4014  *25244  000205                       RTS     R5                 ;EXIT SUBROUTINE
4015  *25246  022701  000001      MARK2A  CMP     #1,R1              ;DID SUBROUTINE GET THE PARAMETER
4016  *25252  001401                       BEQ     .+4
4017  *25254  104000                       HLT                        ;ERROR: SUBROUTINE DID NOT GET PUSHED PARAMETER
4018  *25256  022706  036520              CMP     #STACK,SP          ;IS STACK POINTER CORRECT?
4019  *25262  001401                       BEQ     .+4
4020  *25264  104000                       HLT
4021  *25266  022705  000007              CMP     #7,R5              ;IS R5 CORRECT?
4022  *25272  001401                       BEQ     .+4
4023  *25274  104000                       HLT                        ;ERROR: MARK DID NOT LOAD R5
4024  *25276  104400                       SCOPE
4025
4026                                  .SBTTL  TEST THE SXT INSTRUCTION
4027
4028  *25300  012702  000010              MOV     #10,R2             ;SET UP INDEX REGISTER
4029  *25304  012767  177777  010312      MOV     #-1,TEMP
4030  *25312  000257                       CCC                        ;CLEAR ALL CONDITION CODES
4031  *25314  006762  035614              SXT     C(R2)              ;EXTEND C'S INTO TEMP [C(R2)]
4032  *25320  005767  010300              TST     TEMP
4033  *25324  001401                       BEQ     .+4
4034  *25326  104000                       HLT                        ;ERROR: C'S DID NOT EXTEND INTO TEMP
4035  *25330  104400                       SCOPE
4036
4037  *25332  005067  010266              CLR     TEMP
4038  *25336  000277                       SCC                        ;SET ALL CONDITION CODES
4039  *25340  006767  010260              SXT     TEMP               ;EXTEND 1'S INTO TEMP
4040  *25344  022767  177777  010252      CMP     #-1,TEMP
4041  *25352  001401                       BEQ     .+4
4042  *25354  104000                       HLT
4043  *25356  104400                       SCOPE
4044
4045                                  .SBTTL  TEST THE RTT INSTRUCTION
4046
4047  *25360  012706  036520              MOV     #STACK,SP          ;RESET THE STACK POINTER
4048  *25364  016702  152406              MOV     PS,R2              ;SET UP THE STACK
4049  *25370  010246                       MOV     R2,-(SP)
4050  *25372  012746  025404              MOV     #RTTA,-(SP)
4051  *25376  000006                       RTT
4052  *25400  104000                       HLT                        ;ERROR: RTT FAILED
4053  *25402  000405                       BR      RTTB               ;GO TO SCOPE
4054  *25404  016701  152366      RTTA1   MOV     PS,R1              ;GET STATUS WORD
4055  *25410  020201                       CMP     R2,R1              ;CORRECT STATUS?
4056  *25412  001401                       BEQ     RTTB
4057  *25414  104000                       HLT                        ;ERROR: INCORRECT STATUS
```



```
4058  *25416  104400      RTTB1   SCOPE
4059
4060
4061  *25420  132767  000001  153435      BITB    #1,CONFIG+1        ;IF PROCESSOR DOES
4062  *25426  001002                       BNE     MUL1               ;NOT HAVE EIS
4063  *25430  000167  001374              JMP     MANAG1             ;CHECK FOR KT11
4064
4065                                  .SBTTL  TEST MULTIPLY INSTRUCTION
4066
4067  *25434  005003      MUL1I   CLR     R3                         ;CLEAR R3
4068  *25436  012702  000005              MOV     #5,R2              ;LOAD MULTIPICAND
4069  *25442  012704  000010              MOV     #10,R4             ;LOAD INDEX REGISTER
4070  *25446  012767  000002  010150      MOV     #2,TEMP            ;LOAD MULTIPLIER
4071  *25454  000277                       SCC                        ;PRESET CONDITION CODES
4072  *25456  070274  035616              MUL     @C+2(R4),R2        ;MULTIPLY 2X5 RESULT IN R2 (MSH);R3 (LSH)
4073  *25462  016701  152310              MOV     PS,R1              ;GET CONDITION CODE RESULTS
4074  *25466  032701  000017              BIT     #17,R1             ;CC'S=0?
4075  *25472  001401                       BEQ     .+4                ;BRANCH IF CC'S ARE CORRECT
4076  *25474  104000                       HLT                        ;ERROR: CC'S NOT = TO 0'S
4077  *25476  022703  000012              CMP     #12,R3             ;RESULT =12?
4078  *25502  001401                       BEQ     .+4                ;BRANCH IF THE RESULT (LSH) IS CORRECT
4079  *25504  104000                       HLT                        ;ERROR: INCORRECT RESULT (LSH)
4080  *25506  005702                       TST     R2                 ;CORRECT RESULT (MSH)?
4081  *25510  001401                       BEQ     .+4
4082  *25512  104000                       HLT                        ;INCORRECT RESULT (MSH)
4083  *25514  104400                       SCOPE
4084
4085
4086  *25516  005003      MUL2I   CLR     R3
4087  *25520  012702  125252              MOV     #125252,R2         ;LOAD MULTIPICAND
4088  *25524  012701  000010              MOV     #10,R1             ;LOAD INDEX REGISTER
4089  *25530  012767  000002  010066      MOV     #2,TEMP
4090  *25536  070271  035616              MUL     @C+2(R1),R2        ;MULTIPLY 2X125252 RESULT=-1(R2)
4091                                                                 ;52524(R3),N=1,Z=0,V=0,C=1
4092  *25542  016704  152230              MOV     PS,R4              ;SAVE CONDITION CODES IN REGISTER 4
4093  *25546  042704  177760              BIC     #177760,R4         ;EXTRACT CONDITION CODES
4094  *25552  022704  000011              CMP     #11,R4
4095  *25556  001401                       BEQ     .+4
4096  *25560  104000                       HLT                        ;ERROR: INCORRECT CONDITION CODES
4097  *25562  022702  177777              CMP     #-1,R2             ;CORRECT MSH RESULT?
4098  *25566  001401                       BEQ     .+4
4099  *25570  104000                       HLT                        ;ERROR: INCORRECT MSH RESULT
4100  *25572  022703  052524              CMP     #52524,R3          ;CORRECT LSH RESULT?
4101  *25576  001401                       BEQ     .+4
4102  *25600  104000                       HLT                        ;ERROR: INCORRECT LSH RESULT
4103  *25602  104400                       SCOPE
4104
4105                                  .SBTTL  TEST ASH INSTRUCTION
4106
4107  *25604  012767  000001  010012      ASH1I   MOV     #1,TEMP            ;LOAD SHIFT VALUE (+1 OR 1 PLACE LEFT)
4108  *25612  012705  000010              MOV     #10,R5             ;LOAD INDEX REGISTER
4109  *25616  016702  007750              MOV     R,R2               ;GET VALUE TO BE SHIFTED (#125252)
4110  *25622  052767  000014  152146      BIS     #14,PS
4111  *25630  072275  035616              ASH     @C+2(R5),R2        ;SHIFT 1 PLACE LEFT RESULT = 52524
```

```
4112                                                                    ;N=0,Z=0,V=1,C=1
4113  *25634  *16701  152136                MOV     PS,R1             ;SAVE CONDITION CODES IN REGISTER 1
4114  *25640  *42701  177760                BIC     #177760,R1        ;EXTRACT CONDITION CODES
4115  *25644  *22701  000003                CMP     #3,R1
4116  *25650  *01401                        BEQ     .+4
4117  *25652  104000                        HLT                       ;ERROR! INCORRECT CONDITION CODES
4118  *25654  *22702  052524                CMP     #52524,R2         ;RESULT CORRECT?
4119  *25660  *01401                        BEQ     .+4
4120  *25662  104000                        HLT                       ;ERROR! INCORRECT RESULT
4121  *25664  104400                        SCOPE
4122
4123  *25666  *12767  177777  007730  ASW21: MOV     #-1,TEMP          ;LOAD SHIFT VALUE (-1 OR 1 PLACE RIGHT)
4124  *25674  *12703  000010                MOV     #10,R3            ;LOAD INDEX REGISTER
4125  *25700  *16701  007672                MOV     R-4,R1            ;GET VALUE TO BE SHIFTED (#52525)
4126  *25704  *72173  035616                ASH     @C+2(R3),R1       ;SHIFT 1 PLACE RIGHT RESULT = #25252
4127  *25710  *20127  025252                CMP     R1,#25252         ;RESULT CORRECT?
4128  *25714  *01401                        BEQ     .+4
4129  *25716  104000                        HLT                       ;ERROR! INCORRECT RESULT
4130  *25720  104400                        SCOPE
4131
4132                                .SBTTL  TEST ASHC INSTRUCTION
4133
4134  *25722  *05002                ASHC1:  CLR     R2                ;CLEAR MSW RESULT REGISTER
4135  *25724  *12767  000020  007672        MOV     #16.,TEMP         ;LOAD SHIFT COUNT (16 PLACES LEFT)
4136  *25732  *12704  000010                MOV     #10,R4            ;LOAD INDEX REGISTER
4137  *25736  *16703  007630                MOV     B,R3              ;GET VALUE TO BE SHIFTED (#125252)
4138  *25742  112767  000005  152026        MOVB    #5,PS             ;PRE SET THE CONDITION CODES
4139  *25750  *73274  035616                ASHC    @C+2(R4),R2       ;SHIFT # IN R3 TO R2
4140  *25754  *16701  152016                MOV     PS,R1             ;SAVE CONDITION CODES IN REGISTER 1
4141  *25760  *42701  177760                BIC     #177760,R1        ;EXTRACT CONDITION CODES
4142  *25764  *22701  000012                CMP     #12,R1
4143  *25770  *01401                        BEQ     .+4
4144  *25772  104000                        HLT                       ;ERROR! INCORRECT CONDITION CODES
4145  *25774  *22702  125252                CMP     #125252,R2        ;R2=#125252?
4146  *26000  *01401                        BEQ     .+4               ;BRANCH IF CORRECT RESULT
4147  *26002  104000                        HLT                       ;ERROR!
4148  *26004  *05703                        TST     R3                ;WAS # SHIFTED OUT OF R3?
4149  *26006  *01401                        BEQ     .+4
4150  *26010  104000                        HLT                       ;ERROR! # WAS NOT SHIFTED OUT OF R3 PROPERLY
4151  *26012  104400                        SCOPE
4152
4153  *26014  *05003                ASHC2:  CLR     R3                ;CLEAR RESULT REGISTER
4154  *26016  *12767  177760  007600        MOV     #-16.,TEMP        ;LOAD SHIFT COUNT (16 PLACES RIGHT)
4155  *26024  *12701  000010                MOV     #10,R1            ;LOAD INDEX REGISTER
4156  *26030  *16702  007536                MOV     B,R2              ;LOAD # TO BE SHIFTED (#125252)
4157  *26034  112767  000007  151734        MOVB    #7,PS             ;PRE SET THE CONDITION CODES
4158  *26042  *73271  035616                ASHC    @C+2(R1),R2       ;SHIFT R2 16 PLACES RIGHT INTO R3
4159  *26046  *16704  151724                MOV     PS,R4             ;SAVE CONDITION CODES IN REGISTER 4
4160  *26052  *42704  177760                BIC     #177760,R4        ;EXTRACT CONDITION CODES
4161  *26056  *22704  000010                CMP     #10,R4
4162  *26062  *01401                        BEQ     .+4
4163  *26064  104000                        HLT                       ;ERROR! INCORRECT CONDITION CODES
4164  *26066  *22702  177777                CMP     #-1,R2            ;DID SIGN EXTEND IN R2?
4165  *26072  *01401                        BEQ     .+4
```



```
4166  *26074  104000                        HLT                       ;ERROR! SIGN FAILED TO EXTEND
4167  *26076  *22703  125252                CMP     #125252,R3        ;DID R2 SHIFT TO R3
4168  *26102  *01401                        BEQ     .+4
4169  *26104  104000                        HLT                       ;ERROR! R2 DID NOT SHIFT INTO R3
4170  *26106  104400                        SCOPE
4171
4172                                .SBTTL  TEST THE DIVIDE INSTRUCTION
4173
4174  *26110  *12701  000004          DIV1:   MOV     #4,R1             ;LOAD INDEX REGISTER
4175  *26114  *05002                        CLR     R2                ;CLEAR QUOTIENT REGISTER
4176  *26116  *12703  052525                MOV     #52525,R3         ;LOAD LSW DIVIDEND
4177  *26122  000277                        SCC                       ;PRE SET THE CONDITION CODES
4178  *26124  *71261  035572                DIV     B(R1),R2          ;DIVIDE #52525 BY B(R1) (#52525)
4179                                                                  ;QUOTIENT=1,REM=0,C=N=V=Z=0
4180  *26130  *16704  151642                MOV     PS,R4             ;GET THE CONDITION CODES
4181  *26134  *32704  000017                BIT     #17,R4
4182  *26140  *01401                        BEQ     .+4               ;BRANCH IF 0
4183  *26142  104000                        HLT                       ;ERROR! INCORRECT CONDITION CODES
4184  *26144  *20227  000001                CMP     R2,#1             ;QUOTIENT CORRECT?
4185  *26150  *01401                        BEQ     .+4               ;BRANCH IF THE QUOTIENT IS CORRECT
4186  *26152  104000                        HLT                       ;ERROR! INCORRECT QUOTIENT
4187  *26154  *05703                        TST     R3                ;REMAINDER CORRECT?
4188  *26156  *01401                        BEQ     .+4               ;BRANCH IF THE REMAINDER IS CORRECT
4189  *26160  104000                        HLT                       ;ERROR! INCORRECT REMAINDER
4190  *26162  104400                        SCOPE
4191
4192  *26164  *12703  000010          DIV2:   MOV     #10,R3            ;LOAD INDEX REGISTER
4193  *26170  *12704  157777                MOV     #157777,R4        ;LOAD MSW DIVIDEND
4194  *26174  *12705  100001                MOV     #100001,R5        ;LOAD LSW DIVIDEND
4195  *26200  *12767  100000  007416        MOV     #100000,TEMP      ;LOAD DIVISOR INTO TEMP
4196  *26206  *71473  035616                DIV     @C+2(R3),R4       ;DIVIDE #157777 100001 BY 100000
4197                                                                  ;QUOTIENT=40000,REM=100001,C=N=V=Z=0
4198  *26212  *16701  151560                MOV     PS,R1             ;GET THE CONDITION CODES
4199  *26216  *32701  000017                BIT     #17,R1
4200  *26222  *01401                        BEQ     .+4               ;BRANCH IF 0'S
4201  *26224  104000                        HLT                       ;ERROR! INCORRECT CONDITION CODES
4202  *26226  *20427  040000                CMP     R4,#40000         ;QUOTIENT CORRECT?
4203  *26232  *01401                        BEQ     .+4               ;BRANCH IF THE QUOTIENT IS CORRECT
4204  *26234  104000                        HLT                       ;ERROR! INCORRECT QUOTIENT
4205  *26236  *20527  100001                CMP     R5,#100001        ;REMAINDER CORRECT?
4206  *26242  *01401                        BEQ     .+4               ;BRANCH IF THE REMAINDER IS CORRECT
4207  *26244  104000                        HLT                       ;ERROR! INCORRECT REMAINDER
4208  *26246  104400                        SCOPE
4209
4210  *26250  *32767  000002  152575        BITB    #2,CONFIG+1       ;IF PROCESSOR IS PDP-11/40
4211  *26256  *01016                        BNE     COMFIS            ;WITH FIS, EXECUTE FIS TEST
4212  *26260  *32767  000004  152575        BITB    #4,CONFIG+1       ;IF PROCESSOR IS PDP-11/45
4213  *26266  *01121                        BNE     COMFPP            ;WITH FPP, EXECUTE FPP TEST
4214  *26270  *00167  000534                JMP     MANAG1            ;CHECK MEMORY MANAGEMENT
4215
4216                                .SBTTL  TEST ALL FIS INSTRUCTIONS TOGETHER
4217
4218  *26274  *12706  026530          COMFIS: MOV     #FISSTK,R4        ;SET STACK POINTER
4219  *26300  *12744  107070                MOV     #107070,-(R4)     ;LOAD DATA ONTO STACK
```

```
4220  026304  012744  134343                  MOV     #134343,-(R4)
4221  026310  012744  065432                  MOV     #065432,-(R4)
4222  026314  012744  032107                  MOV     #032107,-(R4)
4223  026320  012744  123456                  MOV     #123456,-(R4)
4224  026324  012744  045670                  MOV     #045670,-(R4)
4225  026330  012744  125252                  MOV     #125252,-(R4)
4226  026334  012744  135252                  MOV     #135252,-(R4)
4227  026340  012744  016161                  MOV     #016161,-(R4)
4228  026344  012744  040616                  MOV     #040616,-(R4)
4229  026350  000240                          NOP
4230  026352  075014                          FSUB+   R4      ;135252,125252-040616,016161=140616,017434
4231  026354  075034                          FDIV+   R4      ;045670,123456/140616,017434=145246,047065
4232  026356  075024                          FMUL+   R4      ;032107,065432=145246,047065=137201,106137
4233  026360  075004                          FADD+   R4      ;134343,107070+137201,106137=137201,115230
4234  026362  016767  151410  007504          MOV     PS,ANS3                 ;SAVE PROCESSOR STATUS
4235  026370  042767  000020  007476          BIC     #20,ANS3                ;CLEAR T BIT FROM RESULT
4236  026376  012467  007466                  MOV     (R4)+,ANS1              ;SAVE FIRST HALF OF ANSWER
4237  026402  012467  007464                  MOV     (R4)+,ANS2              ;SAVE SECOND HALF OF ANSWER
4238  026406  010467  007464                  MOV     R4,ANS4                 ;SAVE FINAL STACK POINTER
4239  026412  122767  000010  007454          CMPB    #10,ANS3                ;CHECK FINAL PSW
4240  026420  001401                          BEQ     .+4
4241  026422  104000                          HLT                             ;FINAL PSW INCORRECT
4242  026424  022767  026530  007444          CMP     #FISSTK,ANS4            ;CHECK STACKPOINTER POSITION
4243  026432  001401                          BEQ     .+4
4244  026434  104000                          HLT                             ;STACK POINTER INCORRECT
4245  026436  022767  137201  007424          CMP     #137201,ANS1            ;CHECK FIRST HALF OF ANSWER
4246  026444  001401                          BEQ     .+4
4247  026446  104000                          HLT                             ;FIRST HALF OF ANSWER INCORRECT
4248  026450  022767  115230  007414          CMP     #115230,ANS2            ;CHECK SECOND HALF OF ANSWER
4249  026456  001401                          BEQ     .+4
4250  026460  104000                          HLT                             ;SECOND HALF OF ANSWER INCORRECT
4251  026462  104400                          SCOPE
4252  026464  000167  000340                  JMP     MANAG1
4253          026530                  .=.+40
4254  026530  000000                  FISSTK: 0
4255
4256                                  .SBTTL  COMBINED FPP INSTRUCTION TEST
4257
4258  026532  170127  047400          COMFPP: LDFPS   #47400
4259  026536  170011                          SETD                            ;SET DOUBLE MODE
4260  026540  177027  077777                  LDCID   #77777,AC0              ;LOAD AC0 WITH 77777
4261  026544  177127  002525                  LDCID   #2525,AC1               ;LOAD AC1 WITH 2525
4262  026550  012702  000012                  MOV     #12,R2                  ;SET STEP COUNTER
4263  026554  174401                  EXLOP:  DIVD    AC1,AC0                 ;DIVIDE 2525 INTO 77777
4264  026556  171001                          MULD    AC1,AC0                 ;MULTIPLY 2525 BY ANSWER
4265  026560  172001                          ADDD    AC1,AC0                 ;ADD 2525 TO ANSWER
4266  026562  173001                          SUBD    AC1,AC0                 ;SUBTRACT 2525 FROM ANSWER
4267  026564  005302                          DEC     R2                      ;DO 10 (DECIMAL) TIMES
4268  026566  001372                          BNE EXLOP
4269  026570  175467  007274                  STCDI   AC0,ANS1                ;SAVE ANSWER
4270  026574  170270                          STFPS   FPS                     ;SAVE FPS
4271  026576  022767  077777  007264          CMP     #77777,ANS1             ;IS RESULT CORRECT?
4272  026604  001401                          BEQ     .+4                     ;YES- BRANCH
4273  026606  104000                          HLT                             ;RESULT INCORRECT
```



```
4274  026610  172467  007022          EX4:    LDD     D1010,AC0               ;GET DATA
4275  026614  012702  036070                  MOV     #ANS1,R2
4276  026620  174022                          STD     AC0,(R2)+
4277  026622  172567  007010                  LDD     D1010,AC1
4278  026626  174122                          STD     AC1,(R2)+
4279  026630  172767  007244                  LDD     ANS5,AC3
4280  026634  170270                          STFPS   FPS
4281  026636  173767  007226                  CMPD    ANS1,AC3
4282  026642  170030                          CFCC
4283  026644  001401                          BEQ     .+4
4284  026646  104000                          HLT                             ;ANS1 AND ANS5 SHOULD = 1010
4285  026650  172567  006764                  LDD     D0101,AC1
4286  026654  174142                          STD     AC1,-(R2)
4287  026656  172012                          ADDD    (R2),AC0
4288  026660  173042                          SUBD    -(R2),AC0
4289  026662  173001                          SUBD    AC1,AC0
4290  026664  175467  007200                  STCDI   AC0,ANS1
4291  026670  022767  000000  007172          CMP     #0,ANS1
4292  026676  170270                          STFPS   FPS
4293  026700  001401                          BEQ     .+4
4294  026702  104000                          HLT
4295  026704  170031                  MORE:   SETF                            ;SET FLOATING MODE
4296  026706  177027  000525                  LDCIF   #525,AC0
4297  026712  177127  000252                  LDCIF   #252,AC1
4298  026716  174134                          STF     AC1,AC4
4299  026720  172134                          ADDF    AC4,AC1                 ;ADD 252 TO 252
4300  026722  172701                          LDF     AC1,AC3                 ;PUT ANSWER IN AC3= 504
4301  026724  173003                          SUBF    AC3,AC0                 ;SUBTRACT 504 FROM 505
4302  026726  175567  007136                  STEXP   AC0,ANS1                ;ANSWER IN ANS1
4303  026732  170270                          STFPS   FPS
4304  026734  022767  000001  007126          CMP     #1,ANS1                 ;CORRECT ANSWER SHOULD BE 1
4305  026742  001401                          BEQ     .+4
4306  026744  104000                          HLT                             ;FPP ANSWER INCORRECT
4307  026746  177027  000021                  LDCIF   #21,AC0
4308  026752  171000                          MULF    AC0,AC0                 ;AC0=21X21=441
4309  026754  174427  040400                  DIVF    #2,AC0                  ;DIVIDE BY 2
4310  026760  171427  040200                  MODF    #1,AC0                  ;GET INTEGER
4311  026764  170230                          STFPS   FPS
4312  026766  175567  007076                  STCFI   AC1,ANS1
4313  026772  022767  000220  007070          CMP     #220,ANS1               ;CHECK ANSWER (INTEGER PART)
4314  027000  001401                          BEQ     .+4
4315  027002  104000                          HLT                             ;ANSWER INCORRECT
4316  027004  171427  041040                  MODF    #10,,AC0                ;GET FRACTION
4317  027010  175567  007054                  STCFI   AC1,ANS1
4318  027014  022767  000005  007046          CMP     #5,ANS1                 ;FRACTION CORRECT?
4319  027022  001401                          BEQ     .+4                     ;YES- BRANCH
4320  027024  104000                          HLT                             ;FRACTIONAL PORTION INCORRECT
4321  027026  104470                          SCOPE
4322
4323  027030  122767  000003  152024  MANAG1: CMPB    #3,CONFIG               ;IF PROCESSOR IS PDP-11/45
4324  027036  001426                          BEQ     MTPD1                   ;EXECUTE THESE TESTS
4325  027040  132767  000010  152015          BITB    #10,CONFIG+1            ;IF PROCESSOR IS PDP-11/40
4326  027046  001002                          BNE     MTPD1                   ;AND HAS MEMORY MANAGEMENT
4327  027050  000167  000510                  JMP     ENDPRO                  ;OPTION, EXECUTE THESE TESTS
```

```
                                        ;SBTTL  TEST MTPD INSTRUCTION
 027054  012767  035624  006544  MTPD11  MOV     #TEMP,TEMP+2
 027062  005001                          CLR     R1
 027064  012706  036520                  MOV     #STACK,SP
 027070  012746  177777                  MOV     #-1,-(SP)
 027074  005066  000002                  CLR     2(SP)
 027100  005067  006520                  CLR     TEMP
 027104  000257                          CCC
 027106  016703  150664                  MOV     PS,R3                   ;SAVE STATUS WORD
 027112  052703  000011                  BIS     #11,R3                  ;INSERT RESULT OF MTPDIS CC'S
 027116  000261                          SEC                             ;SET CARRY
 027120  106671  035626                  MTPD    @TEMP+2(R1)
 027124  016702  150646                  MOV     PS,R2                   ;GET STATUS
 027130  020302                          CMP     R3,R2                   ;IS STATUS CORRECT?
 027132  001401                          BEQ     .+4
 027134  104000                          HLT                             ;ERROR: INCORRECT STATUS AFTER MTPD
                                                                         ;R3 HAS CORRECT RESULT
 027136  026727  006462  177777          CMP     TEMP,#-1                ;DID TOP WORD ON STACK GO TO TEMP?
 027144  001401                          BEQ     .+4
 027146  104000                          HLT                             ;ERROR: MTPD FAILED TO LOAD TEMP
 027150  022726  036520                  CMP     #STACK,SP               ;DID THE STACK POINTER INCREMENT?
 027154  001401                          BEQ     .+4
 027156  104000                          HLT                             ;ERROR: STACK FAILED TO INCREMENT
 027160  104400                          SCOPE

                                        ;SBTTL  TEST MFPD INSTRUCTION

 027162  012706  036520                  MOV     #STACK,SP
 027166  012716  177777                  MOV     #-1,(SP)                ;PRESET THE
 027172  012766  177777  177776          MOV     #-1,2(SP)               ;STACK
 027200  005067  006420                  CLR     TEMP
 027204  005002                          CLR     R2
 027206  012767  035624  006420          MOV     #TEMP,TEMP+12
 027214  000257                          CCC
 027216  000262                          SEV
 027220  106572  035634                  MFPD    @TEMP+10(R2)
 027224  016701  150546                  MOV     PS,R1                   ;SAVE CONDITION CODES IN REGISTER 1
 027230  042701  177760                  BIC     #177760,R1              ;EXTRACT CONDITION CODES
 027234  022701  000004                  CMP     #4,R1                   ;ONLY (2) SHOULD BE SET
 027240  001401                          BEQ     .+4
 027242  104000                          HLT                             ;ERROR: INCORRECT CONDITION CODE RESULTS
 027244  022767  177777  007246          CMP     #-1,STACK               ;WAS TOP WORD ON STACK CHANGED?
 027252  001401                          BEQ     .+4
 027254  104000                          HLT                             ;ERROR: STACK DID NOT DECREMENT BEFORE PUSH
 027256  005767  007234                  TST     STACK-2
 027262  001401                          BEQ     .+4
 027264  104000                          HLT                             ;ERROR: MFU FAILED
 027266  022726  036516                  CMP     #STACK-2,SP             ;DID STACK POINTER DECREMENT
 027272  001401                          BEQ     .+4
 027274  104000                          HLT                             ;ERROR: POINTER FAILED TO DECREMENT
 027276  104400                          SCOPE
```



```
 027300  032767  000001  151554          BIT     #1,CONFIG               ;IF PROCESSOR IS NOT PDP-11/45
 027306  001526                          BEQ     ENDPRO                  ;EXIT PROCESSOR TEST

                                        ;SBTTL  TEST THE SPL INSTRUCTION

 027310  042767  000340  150460          BIC     #340,PS                 ;CLEAR PRIORITY LEVEL BITS IF SET
 027316  000277                          SCC                             ;SET CONDITION CODES
 027320  016702  150452                  MOV     PS,R2
 027324  052702  000340                  BIS     #340,R2
 027330  000277                          SCC                             ;SET CONDITION CODES
 027332  000237                          SPL     7                       ;SET PRIORITY LEVEL =7
 027334  016701  150436                  MOV     PS,R1                   ;GET STATUS WORD
 027340  032701  140000                  BIT     #UM,R1                  ;KERNEL MODE?
 027344  001402                          BEQ     .+6                     ;BRANCH IF KERNEL MODE
 027346  042702  000340                  BIC     #340,R2                 ;SPL IS A 'NOP' IN SPERVISORY & USER MODE
 027352  020201                          CMP     R2,R1                   ;WAS PRIORITY LEVEL SET INTO STATUS
 027354  001401                          BEQ     .+4                     ;(KERNEL MODE ONLY)
 027356  104000                          HLT                             ;ERROR: SPL FAILED TO SET PRIORITY = 7
 027360  042767  000340  150410          BIC     #340,PS
 027366  104400                          SCOPE

                                        ;SBTTL  TEST PIRQ HARDWARE

                                        ;THIS TEST REQUESTS AN INTERRUPT AT LEVEL 3, THE
                                        ;INITIAL PROCESSER PRIORITY IS AT LEVEL 7 AND IS SUCCESIVELY LOWERED
                                        ;UNTIL THE PROCESSER PRIORITY IS LESS THAN THE REQUEST
                                        ;LEVEL AT WHICH TIME THE INTERRUPT REQUEST SHOULD BE HONORED.
 027370  012706  036520                  MOV     #STACK,SP               ;SET STACK POINTER
 027374  016701  150376                  MOV     PS,R1                   ;SAVE PROCESSOR STATUS
 027400  042701  177757                  BIC     #177757,R1              ;EXTRACT T BIT
 027404  112767  000340  150364          MOVB    #340,PS                 ;SET PROCESSER PRIORITY LEVEL =7
 027412  012767  004000  150352          MOV     #4000,PIRQ              ;REQUEST AN INTERRUPT AT LEVEL 3
 027420  022767  004146  150344          CMP     #4146,PIRQ              ;WAS PIRQ REG LOADED PROPERLY
 027426  001402                          BEQ     .+6
 027430  104000                          HLT                             ;ERROR: PIRQ NOT LOADED PROPERLY
 027432  000442                          BR      PIRQEX                  ;EXIT TEST
 027434  012767  027532  150576          MOV     #PIRQA,PIRVEC           ;LOAD INT, REQUEST VECTOR
 027442  016767  150330  150572          MOV     PS,PIRLVL
 027450  000240                          NOP
 027452  112767  000300  150316          MOVB    #300,PS                 ;LOWER PRIORITY TO LEVEL 6
 027460  000240                          NOP
 027462  112767  000240  150306          MOVB    #240,PS                 ;LOWER PRIORITY TO LEVEL 5
 027470  000240                          NOP
 027472  112767  000200  150276          MOVB    #200,PS                 ;LOWER PRIORITY TO LEVEL 4
 027500  000240                          NOP
 027502  112767  000140  150266          MOVB    #140,PS                 ;LOWER PRIORITY TO LEVEL 3
 027510  000240                          NOP
 027512  012767  027536  150520          MOV     #PIRQB,PIRVEC           ;REPOSITION VECTOR
 027520  112767  000100  150250          MOVB    #100,PS                 ;LOWER PRIOITY TO LEVEL 2 AN INTERRUPT
                                                                         ;SHOULD OCCUR
 027526  104000                          HLT                             ;ERROR: INTERRUPT FAILED
 027530  000423                          BR      PIRQEX                  ;GO TO EXIT
 027532  104000                  PIRQA1  HLT                             ;ERROR: AN INTERRUPT OCCURRED WHEN
                                                                         ;PROCESSER PRIORITY >REQUEST LEVEL
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4436  027534  000401                          BR      PIRQEX                  ;GO TO EXIT
4437  027536  000240          PIRQBI: NOP
4438  027540  005067  150226  PIRQEX: CLR     PIRQ
4439  027544  012767  000242  150466          MOV     #242,PIRVEC             ;RESTORE VECTOR
4440  027552  005067  150464                  CLR     PIRLVL
4441  027556  116167  150214                  MOVB    R1,PS
4442  027562  104400                          SCOPE
4443
4444  027564  005767  006000  ENDPRO: TST     PFFLAG                  ;SET WHEN POWER FAILS
4445  027570  001404                          BEQ     WAIT5                   ;EXECUTE WAIT TEST
4446  027572  005067  005772                  CLR     PFFLAG                  ;CLEAR FLAG FOR NEXT POWER FAIL
4447  027576  000167  152590                  JMP     ST                      ;RESTART PROGRAM AND DEVICES
4448
4449                                  ,SBTTL  TEST OF WAIT (TRACE TRAPS)
4450
4451  027602  005067  151230  WAIT5:  CLR     ICOUNT
4452  027606  022767  000006  004174          CMP     #6,TRTRET               ;IF 11/45, BYPASS THIS CODE
4453  027614  001414                          BEQ     WAIT3
4454  027616  104400                          SCOPE
4455  027620  012767  000100  151210          MOV     #100,ICOUNT
4456  027626  032767  000020  150142          BIT     #20,PS                  ;IS TRACE BIT SET
4457  027634  001404                          BEQ     WAIT3                   ;BRANCH IF NOT FOUND
4458  027636  000001                          WAIT                            ;TRACE SHOULD PASS US
4459  027640  000001                          WAIT                            ;THROUGH THE WAIT INSTRUCTION
4460  027642  000001                          WAIT
4461  027644  000001                          WAIT
4462  027646  104400          WAIT3:  SCOPE
4463
4464                                  ,SBTTL  TEST TO SEE IF I/O DEVICES WERE SELECTED
4465
4466  027650  016705  151170                  MOV     SR1,R5                  ;GET FIRST DEVICE SELECTION REGISTER
4467  027654  005105                          COM     R5
4468  027656  032705  173754                  BIT     #173754,R5              ;IF NO INTERRUPTING DEVICES
4469  027662  001014                          BNE     WAIT1                   ;CHECK NEXT SR
4470  027664  016705  151156                  MOV     SR2,R5                  ;GET SECOND DEVICE SELECTION REGISTER
4471  027670  005105                          COM     R5
4472  027672  032705  144637                  BIT     #144637,R5              ;IF NO INTERRUPTING DEVICES SELECTED
4473  027676  001006                          BNE     WAIT1                   ;CHECK NEXT SR
4474  027700  016705  151144                  MOV     SR3,R5                  ;GET THIRD DEVICE SELECTION REGISTER
4475  027704  005105                          COM     R5
4476  027706  032705  000000                  BIT     #0,R5                   ;IF NO INTERRUPTING DEVICES SELECTED
4477  027712  001407                          BEQ     WAIT4                   ;BRANCH IF NO DEVICES SELECTED
4478  027714  012767  000100  151114  WAIT1:  MOV     #100,ICOUNT
4479  027722  000001                          WAIT                            ;INTERRUPTS WILL OCCUR
4480  027724  000001                          WAIT                            ;IF DEVICES ARE SELECTED
4481  027726  000001                          WAIT
4482  027730  000001                          WAIT
4483  027732  104400          WAIT4:  SCOPE
4484  027734  012737  004000  001036          MOV     #4000,@#ICOUNT
4485
4486  027742  036727  151100  000100          BIT     SR2,#100
4487  027750  001402                          BEQ     .+6
4488  027752  000167  000364                  JMP     ENDEAE
4489
```



```
4490                                  ,SBTTL  TEST KE11-A (PDP-11/20) LEFT SHIFT
4491
4492  027756  012777  000000  151240          MOV     #0,@MQ                  ;LOAD MQ WITH 0
4493  027764  012777  125252  151234          MOV     #125252,@AC             ;LOAD AC WITH 125252
4494  027772  012777  177760  151242          MOV     #-16.,@LSH              ;LOAD SHIFT COUNT (LSH) WITH -16
4495  030000  022777  000000  151220          CMP     #0,@AC                  ;COMPARE AC WITH 0
4496  030006  001401                          BEQ     .+4                     ;GO TO ERROR IF BAD
4497  030010  104000                          HLT
4498  030012  022777  125252  151204          CMP     #125252,@MQ             ;COMPARE MQ WITH 125252
4499  030020  001401                          BEQ     .+4                     ;GO TO ERROR IF BAD
4500  030022  104000                          HLT
4501  030024  122777  000020  151200          CMPB    #20,@SR2                ;COMPARE SR WITH 2
4502  030032  001401                          BEQ     .+4                     ;SKIP ERROR IF GOOD
4503  030034  104000                          HLT                             ;HALT ON ERROR (LEFT SHIFT)
4504  030036  104400                          SCOPE
4505
4506                                  ,SBTTL  TEST KE11-A (PDP-11/20) RIGHT SHIFT
4507
4508  030040  012777  000000  151156          MOV     #0,@MQ                  ;LOAD MQ WITH 0
4509  030046  012777  177777  151152          MOV     #-1,@AC                 ;LOAD AC WITH -1
4510  030054  012777  000020  151162          MOV     #16.,@ASH               ;LOAD SHIFT COUNT (ASH) WITH 16.
4511  030062  022777  100000  151136          CMP     #100000,@AC             ;COMPARE AC WITH 100000
4512  030070  001401                          BEQ     .+4                     ;SKIP ERROR IF GOOD
4513  030072  104000                          HLT                             ;HALT ON ERROR
4514  030074  022777  000000  151122          CMP     #0,@MQ                  ;COMPARE MQ WITH 0
4515  030102  001401                          BEQ     .+4                     ;SKIP ERROR IF GOOD
4516  030104  104000                          HLT                             ;HALT ON ERROR
4517  030106  122777  000110  151116          CMPB    #110,@SR2               ;COMPARE SR WITH 10
4518  030114  001401                          BEQ     .+4                     ;SKIP ERROR IF GOOD
4519  030116  104000                          HLT                             ;HALT ON ERROR (RIGHT SHIFT)
4520  030120  104400                          SCOPE
4521
4522                                  ,SBTTL  TEST KE11-A (PDP-11/20) NORMALIZE
4523
4524  030122  012777  125252  151074          MOV     #125252,@MQ             ;LOAD MQ WITH 125252
4525  030130  012777  170000  151070          MOV     #170000,@AC             ;LOAD AC WITH 170000
4526  030136  005077  151076                  CLR     @NOR                    ;START NORMALIZE
4527  030142  022777  100005  151056          CMP     #100005,@AC             ;COMPARE AC WITH 100005
4528  030150  001401                          BEQ     .+4                     ;SKIP ERROR IF GOOD
4529  030152  104000                          HLT                             ;HALT ON ERROR
4530  030154  022777  052520  151042          CMP     #52520,@MQ              ;COMPARE MQ WITH 52520
4531  030162  001401                          BEQ     .+4                     ;SKIP ERROR IF GOOD
4532  030164  104000                          HLT                             ;HALT ON ERROR
4533  030166  122777  000003  151034          CMPB    #3,@SC                  ;COMPARE SC WITH 3
4534  030174  001401                          BEQ     .+4                     ;SKIP ERROR IF GOOD
4535  030176  104000                          HLT                             ;HALT ON ERROR (NORMALIZE)
4536  030200  104400                          SCOPE
4537
4538                                  ,SBTTL  TEST KE11-A (PDP-11/20) MULTIPLY AND DIVIDE BACK TO BACK
4539
4540  030202  012777  052525  151014          MOV     #52525,@MQ
4541  030210  012777  040000  151016          MOV     #40000,@MUL
4542  030216  012777  040000  151012          MOV     #40000,@DIV
4543  030224  012777  040000  151002          MOV     #40000,@MUL
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4544  030232  012777  040000  150776          MOV     #40000,@DIV
4545  030240  012777  040000  150766          MOV     #40000,@MUL
4546  030246  012777  040000  150762          MOV     #40000,@DIV
4547  030254  012777  040000  150752          MOV     #40000,@MUL
4548  030262  012777  040000  150746          MOV     #40000,@DIV
4549  030270  012777  040000  150736          MOV     #40000,@MUL
4550  030276  012777  040000  150732          MOV     #40000,@DIV
4551  030304  022777  052525  150712          CMP     #52525,@MQ
4552  030312  001401                          BEQ     .+4
4553  030314  104000                          HLT
4554  030316  005777  150704                  TST     @AC
4555  030322  001401                          BEQ     .+4
4556  030324  104000                          HLT
4557  030326  122777  000022  150676          CMPB    #22,@SRE                ;CHECK PS 21
4558  030334  001401                          BEQ     .+4
4559  030336  104000                          HLT
4560  030340  104400                          SCOPE
4561  030342                          ENDEAE: 
4562
4563                                  .SBTTL  TEST M792YA PAPER TAPE BOOTSTRAP LOADER
4564
4565  030342  032767  010000  150476  M792YA: BIT     #10000,SR2              ;IF SR2 BIT 12 =1, DO NOT
4566  030350  001041                          BNE     M792YB                  ;TEST M792YA
4567
4568                                          ;TEST OF M792YA
4569
4570  030352  005000                          CLR     R0                      ;SET UP TO GENERATE CHECKSUM
4571  030354  005001                          CLR     R1
4572  030356  012702  173000                  MOV     #173000,R2              ;FIRST WORD OF M792YA
4573                                                                          ;LOCATED AT 773000
4574  030362  062220                  M792A1: ADD     (R2)+,R0                ;GENERATE CHECKSUM
4575  030364  005501                          ADC     R1
4576  030366  022702  173100                  CMP     #173100,R2              ;IF NOT END OF BOOT
4577  030372  001373                          BNE     M792A1                  ;CONTINUE
4578  030374  022737  010712  173014          CMP     #10712,@#173712         ;2 VERSIONS
4579  030402  001010                          BNE     M792A3
4580  030404  020027  067715                  CMP     R0,#67715
4581  030410  001003                          BNE     M792A2                  ;CHECKSUM INCORRECT
4582  030412  020127  000010                  CMP     R1,#10
4583  030416  001415                          BEQ     M792A5                  ;CHECK SUM CORRECT
4584  030420  104000                  M792A2: HLT                             ;ERROR IN M792YA
4585  030422  000413                          BR      M792A5                  ;SCOPE
4586  030424  022737  005012  173014  M792A3: CMP     #5012,@#173014          ;IS IT OTHER VERSION
4587  030432  001006                          BNE     M792A4                  ;NOT M792YA
4588  030434  020027  172735                  CMP     R0,#172735              ;CHECKSUM LOW ORDER
4589  030440  001003                          BNE     M792A4
4590  030442  020127  000010                  CMP     R1,#10
4591  030446  001401                          BEQ     M792A5
4592  030450  104000                  M792A4: HLT                             ;CHECKSUM ERROR, OR
4593                                                                          ;DEVICE IS NOT M792YA
4594  030452  104400                  M792A5: SCOPE
4595
4596                                  .SBTTL  TEST M792YB, MR11DB BULK BOOTSTRAP LOADERS
4597
```



```
4598  030454  032767  020000  150364  M792YB: BIT     #20000,SR2              ;IF SR2 BIT 13=1, DO NOT
4599  030462  001053                          BNE     ENDBOOT                 ;TEST M792YB, MR11-DB
4600  030464  022737  010702  173100          CMP     #10702,@#173100         ;IS DEVICE MR11-DB
4601  030472  001426                          BEQ     MR11DB
4602  030474  022737  013701  173100          CMP     #13701,@#173100         ;IS DEVICE M792YB
4603  030502  001017                          BNE     M792B2
4604  030504  005000                          CLR     R0                      ;SET UP TO GENERATE CHECKSUM
4605  030506  005001                          CLR     R1
4606  030510  012702  173100                  MOV     #173100,R2              ;FIRST WORD OF M792YB
4607                                                                          ;LOCATED AT 773100
4608  030514  062200                  M792B1: ADD     (R2)+,R0                ;GENERATE CHECKSUM
4609  030516  005501                          ADC     R1
4610  030520  022702  173160                  CMP     #173160,R2
4611  030524  001373                          BNE     M792B1
4612  030526  020027  171631                  CMP     R0,#171631              ;TEST LOW ORDER CHECKSUM
4613  030532  001003                          BNE     M792B2
4614  030534  020127  000006                  CMP     R1,#6                   ;TEST HIGH ORDER CHECKSUM
4615  030540  001401                          BEQ     M792B3
4616  030542  104000                  M792B2: HLT                             ;CHECKSUM ERROR
4617  030544  104400                  M792B3: SCOPE
4618  030546  000421                          BR      ENDBOOT
4619  030550  005000                  MR11DB: CLR     R0                      ;SET UP TO GENERATE CHECKSUM
4620  030552  005001                          CLR     R1
4621  030554  012702  173100                  MOV     #173100,R2              ;FIRST WORD OF MR11-DB
4622                                                                          ;LOCATED AT 773100
4623  030560  062200                  MR11D1: ADD     (R2)+,R0                ;GENERATE CHECKSUM
4624  030562  005501                          ADC     R1
4625  030564  022702  173200                  CMP     #173200,R2
4626  030570  001373                          BNE     MR11D1
4627  030572  020027  115056                  CMP     R0,#115056              ;TEST LOW ORDER CHECKSUM
4628  030576  001003                          BNE     MR11D2
4629  030600  020127  000007                  CMP     R1,#7                   ;TEST HIGH ORDER CHECKSUM
4630  030604  001401                          BEQ     MR11D3
4631  030606  104000                  MR11D2: HLT                             ;CHECKSUM ERROR
4632  030610  104400                  MR11D3: SCOPE
4633  030612                          ENDBOOT:
4634
4635                                  .SBTTL  UDC-11 CONTROL TEST
4636
4637                                          ;INTERRUPT ON LEVEL 4 AND 6 ALTERNATELY
4638
4639  030612  032767  004000  150224  UDC11:  BIT     #4000,SR1               ;IF SR1 BIT 11=1, DO NOT
4640  030620  001114                          BNE     DR11B                   ;TEST UDC11
4641  030622  012767  000300  147476          MOV     #300,UDPS               ;SERVICE FIRST INTERRUPT AT LEVEL 6
4642  030630  005077  150624                  CLR     @UDCP                   ;CLEAR CONTROL REGISTER
4643  030634  005077  150622                  CLR     @UDSR                   ;CLEAR SCAN REGISTER
4644  030640  005067  000204                  CLR     UUFLG                   ;CLEAR SOFTWARE DONE FLAG
4645  030644  005067  000026                  CLR     WATCUD                  ;CLEAR UDC11 DEFERRED
4646                                                                          ;INTERRUPT OCCURED FLAG
4647  030650  005067  000006                  CLR     WATCUI                  ;CLEAR UDC11 IMMEDIATE
4648                                                                          ;INTERRUPT OCCURED FLAG
4649  030654  104400                          SCOPE
4650  030656  005777  150600                  TST     @UDSR                   ;GENERATE RIF
4651  030662  000240                          NOP                             ;WAIT FOR CLEAR DONE
```

```
 4652  030664  052777  000025  150566          BIS     #25,@UDCR               ;SET IMMEDIATE INTERRUPT ENABLE
 4653                                                                          ;IMMEDIATE SCAN ENABLE
 4654                                                                          ;GENERATE RIF
 4655  030672  052777  000400  150560          BIS     #400,@UDCR              ;SET MAINTENANCE MODE
 4656  030700  005767  000144                  TST     UDFLG                   ;WAIT FOR INTERRUPT
 4657  030704  100375                          BPL     .-4
 4658  030706  005067  000136                  CLR     UDFLG                   ;CLEAR SOFTWARE DONE FLAG
 4659  030712  012767  000200  147316  IMMI1   MOV     #200,236                ;SERVICE NEXT INTERRUPT AT LEVEL 4
 4660  030720  022777  100201  150532          CMP     #100201,@UDCR           ;IS IMM DONE, ERROR, +RIF SET
 4661  030726  001421                          BEQ     .+4
 4662  030730  104000                          HLT                             ;ERROR
 4663  030732  005777  150524                  TST     @UDSR                   ;GENERATE RIF
 4664  030736  000240                          NOP                             ;WAIT FOR CLR DONE
 4665  030740  012767  000001  001714          MOV     #1,WATCUI               ;SET UDC11 IMMEDIATE
 4666                                                                          ;INTERRUPT OCCURED FLAG
 4667  030746  052777  000013  150504          BIS     #13,@UDCR               ;SET DEFFERED INTERRUPT ENABLE
 4668                                                                          ;DEFERED SCAN ENABLE
 4669  030754  052777  000400  150476          BIS     #400,@UDCR              ;SET MAINTENANCE MODE
 4670  030762  005767  000062                  TST     UDFLG                   ;WAIT FOR INTERRUPT
 4671  030766  100375                          BPL     .-4
 4672  030770  005067  000054                  CLR     UDFLG                   ;CLEAR SOFTWARE DONE FLAG
 4673  030774  012767  000300  147234  DEFI1   MOV     #300,236                ;SERVICE NEXT INTERRUPT AT LEVEL 6
 4674  031002  022777  100041  150450          CMP     #100041,@UDCR           ;IS DEF DONE, ERROR+RIF SET
 4675  031010  001421                          BEQ     .+4
 4676  031012  104000                          HLT                             ;ERROR
 4677  031014  012767  000001  001654          MOV     #1,WATCUD               ;SET UDC DEFERRED
 4678                                                                          ;INTERRUPT OCCURED FLAG
 4679  031022  104400                          SCOPE
 4680  031024  000412                          BR      DR11B
 4681
 4682                                          ;ENTER HERE ON UDC11 INTERRUPT
 4683
 4684  031026  005167  000016          UDINT:  COM     UDFLG                   ;SET SOFTWARE DONE FLAG
 4685  031032  042777  000036  150420          BIC     #36,@UDCR               ;DISABLE CONTROL
 4686  031040  042777  000400  150412          BIC     #400,@UDCR              ;REMOVE INTERRUPT
 4687  031046  000002                          RTI
 4688  031050  000000          UDFLG1: 0
 4689
 4690                                          ;SBTTL  TEST OF DR11B IN MAINTENANCE MODE
 4691
 4692  031052  032767  000040  147766  DR11B1  BIT     #40,SR2
 4693  031060  001035                          BNE     DRENDA
 4694  031062  005067  000100                  CLR     DRFLG
 4695  031066  104400                          SCOPE
 4696  031070  012777  177760  150360          MOV     #-20,@DRWC              ;20 WORD XFER
 4697  031076  012777  031170  150350          MOV     #DRBUF,@DRBA
 4698  031104  012777  177777  150336          MOV     #-1,@DRDBR
 4699  031112  012777  010101  150332          MOV     #010101,@DRS?           ;MAINT, IE AND GO
 4700  031120  005767  000042                  TST     DRFLG
 4701  031124  001775                          BEQ     .-4
 4702  031126  005067  000034                  CLR     DRFLG
 4703  031132  012701  031170                  MOV     #DRBUF,R1
 4704  031136  022121                          CMP     (R1)+,(R1)+             ;FIRST AND SECOND WORD
 4705  031140  001776                          BEQ     .-2                     ;SHOULD BE EQUAL
```



```
 4706  031142  020127  031230                  CMP     R1,#DREND
 4707  031146  101001                          BHI     .+4
 4708  031150  104000                          HLT                             ;BAD DR11B DATA
 4709  031152  104400                          SCOPE
 4710  031154  000167  000050          DRENDA: JMP     DN11
 4711
 4712                                          ;ENTER HERE ON DR11-B INTERRUPT
 4713
 4714  031160  005267  000002          DRIR:   INC     DRFLG
 4715  031164  000002                          RTI
 4716  031166  000000          DRFLG1: 0
 4717  031170                  DRBUF:
 4718  031170  000000                          .W                              ;SOURCE IS TRANSFERRED TO
 4719  031172  000000                          .W                              ;DESTINATION
 4720  031174  000000                          .WN
 4721  031176  000000                          .WN
 4722          031230                          .W=.
 4723  031200  031200                          .W                              ;SOURCE IS TRANSFERRED TO
 4724  031202  031200                          .W                              ;DESTINATION
 4725  031204  146620                          .WN
 4726  031206  146620                          .WN
 4727          031210                          .W=.
 4728  031210  031210                          .W                              ;SOURCE IS TRANSFERRED TO
 4729  031212  031210                          .W                              ;DESTINATION
 4730  031214  146570                          .WN
 4731  031216  146570                          .WN
 4732          031220                          .W=.
 4733  031220  031220                          .W                              ;SOURCE IS TRANSFERRED TO
 4734  031222  031220                          .W                              ;DESTINATION
 4735  031224  146540                          .WN
 4736  031226  146540                          .WN
 4737          031230                          .W=.
 4738  031230                  DREND:
 4739
 4740                                          ;SBTTL  TEST OF DN11 IN MAINTENANCE MODE
 4741
 4742  031232  032767  002000  147610  DN11:   BIT     #2000,SR2               ;IF SR2 BIT13=1, DO NOT
 4743  031236  001074                          BNE     DNEND                   ;TEST DN11 DIGITAL DIALER
 4744  031240  012777  031432  150066          MOV     #DN1SR,@DNVEC           ;SET UP DN11 INTERRUPT VECTOR
 4745  031246  012777  000200  150062          MOV     #200,@DNLVL             ;SET UP INTERRUPT SERVICE LEVEL
 4746  031254  052767  000200  146514          BIS     #200,PS                 ;SET PROCESSOR TO PRIORITY 4
 4747  031262  005067  000166                  CLR     DNFLG                   ;CLEAR SOFTWARE DONE FLAG
 4748  031266  104400                          SCOPE
 4749  031270  012777  000515  150034          MOV     #515,@DNCSR             ;SET CALL REQUEST, MASTER
 4750                                                                          ;ENABLE, MAINTENANCE MODE
 4751                                                                          ;INTERRUPT ENABLE,
 4752                                                                          ;FORCE PRESENT NEXT DIGIT
 4753  031276  042767  000340  146472          BIC     #340,PS                 ;ALLOW INTERRUPTS
 4754  031304  005767  000144                  TST     DNFLG                   ;WAIT FOR INTERRUPT
 4755  031310  100375                          BPL     .-4
 4756  031312  005067  000136                  CLR     DNFLG                   ;CLEAR SOFTWARE DONE FLAG
 4757  031316  012777  001115  150006          MOV     #1115,@DNCSR            ;SET CALL REQUEST, MASTER
 4758                                                                          ;ENABLE, MAINTENANCE MODE,
 4759                                                                          ;INTERRUPT ENABLE
```

```
4760                                                                    ;FORCE DATA SET STATUS
4761  *31324  042767  000340  146444          BIC     #340,PS           ;ALLOC INTERRUPTS
4762  *31332  005767  000116                  TST     DNFLG             ;WAIT FOR INTERRUPT
4763  *31336  100375                          BPL     .-4
4764  *31340  005067  000110                  CLR     DNFLG             ;CLEAR SOFTWARE DONE FLAG
4765  *31344  012777  000115  147760          MOV     #115,@DNCSR       ;SET CALL REQUEST, MASTER
4766                                                                    ;ENABLE,MAINTENANCE MODE
4767                                                                    ;INTERRUPT ENABLE
4768  *31352  052777  002000  147752          BIS     #2000,@DNCSR      ;FORCE POWER OFF
4769  *31360  042767  000340  146410          BIC     #340,PS           ;ENABLE INTERRUPTS
4770  *31366  005767  000062                  TST     DNFLG             ;WAIT FOR INTERRUPT
4771  *31372  100375                          BPL     .-4
4772  *31374  005067  000054                  CLR     DNFLG             ;CLEAR SOFTWARE DONE FLAG
4773  *31400  012777  004115  147724          MOV     #4115,@DNCSR      ;SET CALL REQUEST, MASTER
4774                                                                    ;ENABLE, MAINTENANCE MODE
4775                                                                    ;INTERRUPT ENABLE
4776                                                                    ;FORCE ABANDON CALL AND RETRY
4777  *31406  042767  000340  146362          BIC     #340,PS           ;ALLOW INTERRUPTS
4778  *31414  005767  000034                  TST     DNFLG             ;WAIT FOR INTERRUPT
4779  *31420  100375                          BPL     .-4
4780  *31422  005067  000026                  CLR     DNFLG             ;CLEAR SOFTWARE DONE FLAG
4781  *31426  104400                          SCOPE
4782  *31430  000412                  DNENDI  BR      DRACT
4783
4784                                          ;ENTER HERE ON DN11 INTERRUPT
4785
4786  *31432  105777  147674          DNISRI  TSTB    @DNCSR            ;TEST FOR DONE
4787  *31436  100431                          BMI     .+4
4788  *31440  104000                          HLT                       ;DONE NOT SET, ERROR
4789  *31442  005077  147664                  CLR     @DNCSR            ;CLEAR CONTROL REGISTER
4790  *31446  005167  000002                  COM     DNFLG             ;SET SOFTWARE DONE FLAG
4791  *31452  000002                          RTI
4792  *31454  000000                  DNFLGI  0
4793
4794                                  .SBTTL  TEST OF DR11-A,C IN MAINTENANCE MODE
4795
4796                                  ;NOTE:  MAINTENANCE CABLE MUST BE INSTALLED!!!
4797
4798  *31456  032767  000004  147364  DRACT:  BIT     #4,SR3            ;IF SR3 BIT 2=1, DO NOT
4799  *31464  001171                          BNE     KGSTRT            ;TEST DR11-A, DR11-C GENERAL REGISTER
4800  *31466  005267  147344                  CLR     ICOUNT            ;CLEAR ITERATION COUNT
4801  *31472  005077  147430                  CLR     @DRACCS           ;CLEAR CONTROL REGISTER
4802  *31476  005001                          CLR     R1                ;CLEAR TEST DATA
4803  *31500  104400                          SCOPE
4804  *31502  010177  147422          DRACT1: MOV     R1,@DRACOB        ;MOV DATA TO OUTPUT BUFFER
4805  *31506  020177  147416                  CMP     R1,@DRACOB        ;CHECK DATA
4806  *31512  001401                          BEQ     .+4
4807  *31514  104000                          HLT
4808  *31516  020177  147410                  CMP     R1,@DRACIB        ;CHECK RECEIVED DATA
4809  *31522  001401                          BEQ     .+4
4810  *31524  104000                          HLT
4811  *31526  005201                          INC     R1                ;UPDATE TRANSMIT DATA
4812  *31530  001364                          BNE     DRACT1            ;CONTINUE IF NOT 0
4813  *31532  104400                          SCOPE
```



```
4814  *31534  012777  031664  147372          MOV     #DRACT1,@DRIVEC   ;SET UP INPUT INTERRUPT VECTOR
4815  *31542  012777  000240  147366          MOV     #240,@DRILVL
4816  *31550  012777  031666  147362          MOV     #DRACTO,@DROVEC   ;SET UP OUTPUT INTERRUPT VECTOR
4817  *31556  012777  000240  147356          MOV     #240,@DROLVL
4818  *31564  104400                          SCOPE
4819  *31566  012767  004000  147242          MOV     #4000,ICOUNT
4820  *31574  005002                          CLR     R2
4821  *31576  005077  147326                  CLR     @DRACOB           ;CLEAR CONTROL REGISTER
4822  *31602  005077  147320                  CLR     @DRACCS           ;CLEAR CONTROL REGISTER
4823  *31606  052767  000240  146162          BIS     #240,PS           ;LOCK OUT DR11-A,C INTERRUPTS
4824  *31614  012777  000003  147304          MOV     #3,@DRACCS        ;SET MAINTENANCE BITS FOR
4825                                                                    ;DR11-C INTERRUPT GENERATION
4826  *31622  012777  100200  147300          MOV     #100200,@DRACOB   ;SET MAINTENANCE BITS FOR
4827                                                                    ;DR11-A INTERRUPT GENERATION
4828  *31630  052777  000140  147270          BIS     #140,@DRACCS      ;SET INTERRUPT ENABLES
4829  *31636  042767  000240  146132          BIC     #240,PS           ;ALLOW INTERRUPTS
4830  *31644  005777  147256                  TST     @DRACCS           ;WAIT FOR INPUT INTERRUPT
4831  *31650  100375                          BPL     .-4
4832  *31652  105777  147250                  TSTB    @DRACCS           ;WAIT FOR OUTPUT INTERRUPT
4833  *31656  100375                          BPL     .-4
4834  *31660  104400                          SCOPE
4835  *31662  000402                          BR      KGSTRT
4836  *31664  000002                  DRACTI: RTI
4837  *31666  000002                  DRACTO: RTI
4838
4839                                  .SBTTL  TEST KG11-A CYCLIC REDUNDANCY CHECK OPTION
4840
4841                                  ;TEST THE RESULTS OF CRC16, CCITT, AND CRC12 BY COMPARING
4842                                  ;KNOWN RESULTS AGAINST HARDWARE GENERATED DATA
4843
4844  *31672  032767  000001  147152  KGSTRT: BIT     #1,SR3            ;IF SR3 BIT 0=1, DO NOT
4845  *31676  001242                          BNE     KGEND             ;TEST KG11A
4846  *31700  104400                          SCOPE
4847  *31702  012701  032010          KGTEST: MOV     #KGIP,R1          ;INSTRUCTION TO BE EXECUTED
4848  *31706  012702  032016                  MOV     #KGDP,R2          ;TABLE OF DATA
4849  *31712  012704  032056                  MOV     #KGCP,R4          ;TABLE OF RESULTS
4850  *31716  012777  000020  147542  KGTA:   MOV     #20,@KGCSR        ;CLEAR BCC REGISTER
4851  *31724  011177  147534                  MOV     (R1),@KGCSR       ;SET UP CSR FROM INSTRUCTION TABLE
4852  *31730  011277  147534                  MOV     (R2),@KGDBR       ;SEND DATA TO DEVICE
4853                                                                    ;START BCC COMPUTATION
4854  *31734  105777  147524                  TSTB    @KGCSR            ;WAIT FOR DONE
4855  *31740  001775                          BEQ     .-4               ;PROGRAM WILL HANG IF DONE NEVER SETS
4856  *31742  017767  147520  003654          MOV     @KGBCC,TEMP       ;READ RESULTS OF BCC
4857  *31750  021467  003650                  CMP     (R4),TEMP         ;COMPARE EXPECTED AND RECEIVED RESULTS
4858  *31754  001401                          BEQ     .+4
4859  *31756  104000                          HLT                       ;BCC INCORRECT, ERROR
4860  *31760  022224                          CMP     (R2)+,(R4)+       ;ADVANCE DATA AND RESULT POINTERS
4861  *31762  020227  032056                  CMP     R2,#KGCP          ;END OF DATA
4862  *31766  001353                          BNE     KGTA              ;NO, CONTINUE
4863  *31770  012702  032016                  MOV     #KGDP,R2          ;RESET DATA POINTER
4864  *31774  022167  000014                  CMP     (R1)+,KGC12       ;ADVANCE INSTRUCTION POINTER
4865  *32000  001346                          BNE     KGTA
4866  *32002  104400                          SCOPE
4867  *32004  000167  000206          KGEND:  JMP     DM11BB
```

```
 4868  032010  000111                KGP1:   000111                          ;CRC16 INSTRUCTION WORD
 4869  032012  000115                KGCIT1: 000115                          ;CCITT INSTRUCTION WORD
 4870  032014  000100                KGC121: 000100                          ;CRC12 INSTRUCTION WORD
 4871
 4872                                        ;DATA TABLE FOR CRC TESTS
 4873
 4874  032016  000401                KGDP1:  000401
 4875  032020  177376                        177376
 4876  032022  001002                        001002
 4877  032024  176775                        176775
 4878  032026  002004                        002004
 4879  032030  175773                        175773
 4880  032032  004010                        004010
 4881  032034  173767                        173767
 4882  032036  010020                        010020
 4883  032040  167757                        167757
 4884  032042  020040                        020040
 4885  032044  157737                        157737
 4886  032046  040100                        040100
 4887  032050  137677                        137677
 4888  032052  100200                        100200
 4889  032054  077577                        077577
 4890
 4891                                        ;RESULT TABLE FOR CRC16
 4892
 4893  032056  050300                KGCP1:  050300
 4894  032060  160301                        160301
 4895  032062  120600                        120600
 4896  032064  010601                        010601
 4897  032066  001403                        001403
 4898  032070  131402                        131402
 4899  032072  003006                        003006
 4900  032074  133007                        133007
 4901  032076  006014                        006014
 4902  032100  136015                        136015
 4903  032102  014030                        014030
 4904  032104  124031                        124031
 4905  032106  030060                        030060
 4906  032110  100061                        100061
 4907  032112  060140                        060140
 4908  032114  150141                        150141
 4909
 4910                                        ;RESULT TABLE FOR CCITT
 4911
 4912  032116  004121                        004121
 4913  032120  174351                        174351
 4914  032122  010242                        010242
 4915  032124  160032                        160032
 4916  032126  020504                        020504
 4917  032130  150774                KGCP2:  150774
 4918  032132  041210                        041210
 4919  032134  131060                KGCP3:  131060
 4920  032136  102420                        102420
 4921  032140  072650                KGCP4:  072650
```



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 4922  032142  001061                KGCP5:  001061
 4923  032144  171211                KGCP6:  171211
 4924  032146  002142                        002142
 4925  032150  172332                KGCP7:  172332
 4926  032152  004304                KGCP8:  004304
 4927  032154  174174                KGCP9:  174174
 4928
 4929                                        ;RESULT TABLE FOR CRC12
 4930  032156  024051                        024051
 4931  032160  030061                KGC121: 030061
 4932  032162  024421                KGC122: 024421
 4933  032164  030411                KGC123: 030411
 4934  032166  025041                KGC124: 025041
 4935  032170  031071                KGC125: 031071
 4936  032172  026401                KGC126: 026401
 4937  032174  032431                KGC127: 032431
 4938  032176  021001                KGC128: 021001
 4939  032200  035031                KGC129: 035031
 4940  032202  036001                KGC12A: 036001
 4941  032204  022031                KGC12B: 022031
 4942  032206  000020                KGC12C: 000020
 4943  032210  014030                KGC12D: 014030
 4944  032212  000020                KGC12E: 000020
 4945  032214  014030                KGC12F: 014030
 4946
 4947                                .SBTTL  DM11-BB MODEM CONTROL TEST
 4948
 4949                                        ;DM11-BB MODEM CONTROL MULTIPLEXER
 4950                                        ;SCANNER LOGIC TEST
 4951                                        ;INPUT 1'S INTO ALL SCANNER MEMORY LOCATIONS
 4952                                        ;VERIFY THAT AN INTERRUPT OCCURS FOR EACH LINE
 4953
 4954          004000                CLRSCN=4000
 4955          002000                CLRMUX=2000
 4956          001000                MAINT=1000
 4957          000400                STEP=400
 4958          000100                INTENA=100
 4959          000040                SCNENA=40
 4960          000200                DONE=200
 4961          000020                BUSY=20
 4962  032216  032767  000010  146624  DM11BB: BIT     #10,SR3         ;IF SR3 BIT 3=1, DO NOT
 4963  032224  001100                        BNE     DMBEND          ;TEST DM11-BB
 4964  032226  104400                        SCOPE
 4965  032230  012777  006000  147274  SCNT11: MOV     #CLRMUX+CLRSCN,@#MRCSR
 4966  032236  032777  000020  147266          BIT     #BUSY,@#MBCSR   ;CLEAR ALL MULTIPLEXER FLIPFLOPS
 4967  032244  001374                        BNE     .-6
 4968  032246  012700  000020                MOV     #16.,R0         ;SET UP TO WRITE 1'S INTO
 4969  032252  005077  147254                CLR     @#MBCSR         ;ALL LINE ENABLE FLIPFLOPS
 4970  032256  012777  000001  147250  SCNT1A: MOV     #1,@#MBLSR      ;SET FLIPFLOP
 4971  032264  052777  000400  147240          BIS     #STEP,@#MBCSR   ;GO TO NEXT LINE
 4972  032272  005300                        DEC     R0
 4973  032274  001370                        BNE     SCNT1A
 4974  032276  012777  032410  147232          MOV     #DMBINT,@#MBVEC ;SET UP LOCAL INTERRUPT SERVICE
 4975  032304  012705  171340                MOV     #171340,R5
```

```
4976  032310  012777  000200  147222          MOV     #200,@DMBLVL            ;SERVICE AT LEVEL 4
4977  032316  012700  000020                  MOV     #16.,R0
4978  032322  012777  001117  147202          MOV     #MAINT+INTENA+I7,@DMBCSR;SET INTERRUPT ENABLE AND MAINTENANCE MODE
4979  032330  052767  000200  145440  SCNT1B: BIS     #200,PS                 ;INHIBIT INTERRUPTS
4980  032336  052777  000040  147166          BIS     #SCNENA,@DMBCSR         ;START SCANNER
4981  032344  042767  000200  145424          BIC     #200,PS
4982  032352  105777  147154                  TSTB    @DMBCSR
4983  032356  100375                          BPL     .-4
4984  032360  020577  147146                  CMP     R5,@DMBCSR
4985  032364  001401                          BEQ     SCNT1D
4986  032366  104000                          HLT                             ;SCANNER LOGIC ERROR
4987  032370  042777  000240  147134  SCNT1D: BIC     #SCNENA+DONE,@DMBCSR    ;CLEAR SCAN ENABLE AND DONE
4988  032376  005205                          INC     R5                      ;UPDATE EXPECTED RESULT
4989  032400  005300                          DEC     R0                      ;CONTINUE IF NOT DONE
4990  032402  001352                          BNE     SCNT1B
4991  032404  104400                  SCNT1E: SCOPE                           ;CHECK FOR ITERATIONS, LOOP
4992  032406  000477                          BR      DMBEND
4993
4994                                          ;ENTER HERE ON DM11 -BB INTERRUPT
4995
4996  032410  105777  147116          DMBINT: TSTB    @DMBCSR                 ;IS DONE BIT SET
4997  032414  100001                          BPL     .+4
4998  032416  000002                          RTI                             ;YES, RETURN
4999  032420  104000                          HLT                             ;INTERRUPT WITH DONE NOT SET
5000  032422  022626                          CMP     (SP)+,(SP)+             ;ADJUST STACK
5001  032424  000767                          BR      SCNT1E                  ;RESTART AFTER ERROR
5002  032426                          DMBEND: .
5003
5004                                  .SBTTL  DEVICE WATCHDOGS
5005
5006                                          ;VERIFY SELECTED DEVICES ARE RUNNING
5007
5008  032426  005067  146404          WATCHI: CLR     ICOUNT
5009  032432  032767  004000  145130          BIT     #4000,SR                ;IF ITERATIONS ARE INHIBITED
5010  032440  001402                          BEQ     .+6                     ;DO NOT CHECK WATCHDOGS
5011  032442  000167  000450                  JMP     ENDWATCH
5012  032446  016701  146372                  MOV     SR1,R1
5013  032452  016702  146370                  MOV     SR2,R2
5014  032456  032701  000020                  BIT     #20,R1                  ;IF KW11-L WAS NOT SELECTED
5015  032462  001006                          BNE     WAT1                    ;DO NOT CHECK WATCHDOG
5016  032464  005767  000006                  TST     WATCKL                  ;DID KW11-L INTERRUPT
5017  032470  001001                          BNE     .+4
5018  032472  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5019  032474  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5020  032476  000000                  WATCKL: 0                               ;KW11-L INTERRUPT OCCURED FLAG
5021  032500  032767  000100  146336  WAT1:   BIT     #100,SR1                ;IF KW11-P WAS NOT SELECTED
5022  032506  001006                          BNE     WAT2                    ;DO NOT CHECK WATCHDOG
5023  032510  005767  000006                  TST     WATCKP
5024  032514  001001                          BNE     .+4
5025  032516  104000                          HLT
5026  032520  005027                          CLR     (PC)+
5027  032522  000000                  WATCKP: 0
5028  032524  032701  000400          WAT2:   BIT     #400,R1                 ;IF BUS TESTER SECTIONS 1 AND 2
5029  032530  001014                          BNE     WAT3                    ;WERE NOT SELECTED
```



```
5030                                                                          ;DO NOT CHECK WATCHDOG
5031  032532  005767  000006                  TST     WATCAB                  ;DID BUS TESTER SECTION 1 INTERRUPT
5032  032536  001001                          BNE     .+4
5033  032540  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5034  032542  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5035  032544  000000                  WATCAB: 0                               ;BUS TESTER SECTION 1
5036                                                                          ;INTERRUPT OCCURED FLAG
5037  032546  005767  000006                  TST     WATCBB                  ;DID BUS TESTER SECTION 2 INTERRUPT
5038  032552  001001                          BNE     .+4
5039  032554  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5040  032556  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5041  032560  000000                  WATCBB: 0                               ;BUS TESTER SECTION 2
5042                                                                          ;INTERRUPT OCCURED FLAG
5043  032562  032701  001000          WAT3:   BIT     #1000,R1                ;IF BUS TESTER SECTIONS 3 AND 4
5044                                                                          ;WERE NOT SELECTED
5045  032566  001014                          BNE     WAT4                    ;DO NOT CHECK WATCHDOG
5046  032570  005767  000006                  TST     WATCCB                  ;DID BUS TESTER SECTION 3 INTERRUPT
5047  032574  001001                          BNE     .+4
5048  032576  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5049  032600  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5050  032602  000000                  WATCCB: 0                               ;BUS TESTER SECTION 3
5051                                                                          ;INTERRUPT OCCURED FLAG
5052  032604  005767  000006                  TST     WATCDB                  ;DID BUS TESTER SECTION 4 INTERRUPT
5053  032610  001001                          BNE     .+4
5054  032612  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5055  032614  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5056  032616  000000                  WATCDB: 0                               ;BUS TESTER SECTION 4
5057                                                                          ;INTERRUPT OCCURED FLAG
5058  032620  032701  002000          WAT4:   BIT     #2000,R1                ;IF RF11 WAS NOT SELECTED
5059  032624  001006                          BNE     WAT5                    ;DO NOT CHECK WATCHDOG
5060  032626  005767  000006                  TST     WATCRF                  ;DID RF11 INTERRUPT
5061  032632  001001                          BNE     .+4
5062  032634  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5063  032636  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5064  032640  000000                  WATCRF: 0                               ;RF11 INTERRUPT OCCURED FLAG
5065  032642  032701  004000          WAT5:   BIT     #4000,R1                ;IF UDC11 WAS NOT SELECTED
5066  032646  001014                          BNE     WAT6                    ;DO NOT CHECK WATCHDOG
5067  032650  005767  000006                  TST     WATCUI                  ;DID IMMEDIATE INTERRUPT OCCUR
5068  032654  001001                          BNE     .+4
5069  032656  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5070  032660  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5071  032662  000000                  WATCUI: 0                               ;UDC11 IMMEDIATE INTERRUPT
5072  032664  005767  000006                  TST     WATCUD                  ;DID DEFERED INTERRUPT OCCUR
5073  032670  001001                          BNE     .+4
5074  032672  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5075  032674  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5076  032676  000000                  WATCUD: 0                               ;UDC11 DEFERED INTERRUPT
5077  032700  032701  010000          WAT6:   BIT     #10000,R1               ;IF RC11 WAS NOT SELECTED
5078  032704  001006                          BNE     WAT7                    ;DO NOT CHECK WATCHDOG
5079  032706  005767  000006                  TST     WATCRC                  ;DID RC11 INTERRUPT
5080  032712  001001                          BNE     .+4
5081  032714  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5082  032716  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5083  032720  000000                  WATCRC: 0                               ;RC11 INTERRUPT OCCURED FLAG
```

```
5084  032722  032702  000001          WAT71   BIT     #1,R2                   ;IF DC11 #1 WAS NOT SELECTED
5085  032726  001006                          BNE     WAT8                    ;DO NOT CHECK WATCHDOG
5086  032730  005767  000006                  TST     WATDC1                  ;DID DC11 #1 INTERRUPT
5087  032734  001001                          BNE     .+4
5088  032736  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5089  032740  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5090  032742  000000          WATDC1: 0                                       ;DC11 #1 INTERRUPT OCCURED FLAG
5091  032744  032702  000002          WAT81   BIT     #2,R2                   ;IF DC11 #2 WAS NOT SELECTED
5092  032750  001006                          BNE     WAT9                    ;DO NOT CHECK WATCHDOG
5093  032752  005767  000006                  TST     WATDC2                  ;DID DC11 #1 INTERRUPT
5094  032756  001001                          BNE     .+4
5095  032760  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5096  032762  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5097  032764  000000          WATDC2: 0                                       ;DC11 #2 INTERRUPT OCCURED FLAG
5098  032766  032702  000010          WAT91   BIT     #10,R2                  ;IF AFC11 WAS NOT SELECTED
5099  032772  001006                          BNE     WAT12                   ;DO NOT CHECK WATCHDOG
5100  032774  005767  000006                  TST     WATCAF                  ;DID AFC11 INTERRUPT
5101  033000  001001                          BNE     .+4
5102  033002  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5103  033004  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5104  033006  000000          WATCAF: 0                                       ;AFC11 INTERRUPT OCCURED FLAG
5105  033010  032702  000020          WAT101  BIT     #20,R2                  ;IF RK11 WAS NOT SELECTED
5106  033014  001006                          BNE     WAT12                   ;DO NOT CHECK WATCHDOG
5107  033016  005767  000006                  TST     WATCRK                  ;DID RK11 INTERRUPT
5108  033022  001001                          BNE     .+4
5109  033024  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5110  033026  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5111  033030  000000          WATCRK: 0                                       ;RK11 INTERRUPT OCCURED FLAG
5112  033032  032702  000200          WAT121  BIT     #200,R2                 ;IF AD01 WAS NOT SELECTED
5113  033036  001006                          BNE     WAT13                   ;DO NOT CHECK WATCHDOG
5114  033040  005767  000006                  TST     WATCAD                  ;DID AD01 INTERRUPT
5115  033044  001001                          BNE     .+4
5116  033046  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5117  033050  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5118  033052  000000          WATCAD: 0                                       ;AD01 INTERRUPT OCCURED FLAG
5119  033054  032702  040000          WAT131  BIT     #40000,R2               ;IF DP11 WAS NOT SELECTED
5120  033060  001006                          BNE     WAT14                   ;DO NOT CHECK WATCHDOG
5121  033062  005767  000006                  TST     WATCDP                  ;DID DP11 INTERRUPT
5122  033066  001001                          BNE     .+4
5123  033070  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5124  033072  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5125  033074  000000          WATCDP: 0                                       ;DP11 INTERRUPT OCCURED FLAG
5126  033076  005702          WAT141  TST     R2                      ;IF DM11 WAS NOT SELECTED
5127  033100  100406                  BMI     WAT15                   ;DO NOT CHECK WATCHDOG
5128  033102  005767  000006                  TST     WATCDM                  ;DID DM11 INTERRUPT
5129  033106  001001                          BNE     .+4
5130  033110  104000                          HLT                             ;NO INTERRUPT THIS PASS, ERROR
5131  033112  005027                          CLR     (PC)+                   ;CLEAR INTERRUPT OCCURED FLAG
5132  033114  000000          WATCDM: 0                                       ;DM11 INTERRUPT OCCURED FLAG
5133  033116                  WAT151:
5134  033116                  ENDWAT:
5135
5136                                  .SBTTL  MEMORY EXPANSION TEST
5137
```



```
5138                                    ;DO SIMPLE CORE EXPANSION TO REST OF MEMORY
5139  033116  036727  144446  001000          BIT     SR,#1000                ;TEST FOR MEMORY EXPANSION
5140  033124  001065                          BNE     EXPAN3                  ;SHOULD BE SWITCH TEST
5141  033126  012737  000002  001036          MOV     #2,@#ICOUNT
5142  033134  012767  033142  145722          MOV     #EXPAND,RETURN
5143  033142  026767  145704  145706  EXPAND: CMP     LOCORE,HCORE            ;MORE THAN 8KW?
5144  033150  103053                          BHIS    EXPAN3                  ;NO - DON'T EXPAND
5145  033152  016701  145674                  MOV     LOCORE,R1               ;YES EXPAND
5146  033156  012702  033226          EXPAN1: MOV     #LTESTL,R2              ;MOVE THE CODE BETWEEN
5147  033162  012221                  EXPAN2: MOV     (R2)+,(R1)+             ;LTESTL AND HTESTL TILL
5148  033164  020227  033300                  CMP     R2,#HTESTL+2            ;CORE IS FULL
5149  033170  001374                          BNE     EXPAN2
5150  033172  020167  145660                  CMP     R1,HCORE
5151  033176  101767                          BLOS    EXPAN1                  ;BRANCH TILL MEMORY IS FULL
5152  033200  012721  000137                  MOV     #137,(R1)+              ;SET UP RETURN FROM
5153  033204  012721  033300                  MOV     #EXPAN3,(R1)+           ;HIGH CORE JMP @#EXPAND3
5154  033210  104400                          SCOPE
5155  033212  012737  004000  001036          MOV     #4000,@#ICOUNT
5156  033220  000177  145626                  JMP     @LOCORE
5157  033224  151456          ROTVAL: 151456
5158
5159                                    ;THIS IS THE TEST THAT WILL BE EXPANDED
5160                                    ;IN TO THE REST OF MEMORY
5161          000000                          HERE=0
5162
5163  033226  000277          LTESTL: SCC                             ;SET CARRY BIT
5164  033230  012727  123456  000000          MOV     #123456,#HERE           ;HERE CONTAINS VALUE
5165  033236  106067  177773          LTEST1: RORB    LTEST1+1                ;HERE IS ROTATED
5166  033242  103401                          BCS     .+4
5167  033244  104000                          HLT                             ;C BIT WAS NOT SET
5168  033246  102001                          BVC     .+4
5169  033250  104000                          HLT
5170  033252  022767  151456  177754          CMP     #151456,LTEST1+2        ;CHECK HERE FOR CORRECT ROTATE BYTE
5171  033260  001401                          BEQ     .+4
5172  033262  104000                          HLT                             ;ROTATE FAILED
5173  033264  023767  033224  177742          CMP     @#ROTVAL,LTEST1+2
5174  033272  001401                          BEQ     .+4
5175  033274  104000                          HLT                             ;REF TO LOW MEMORY FAILED
5176  033276  104400          HTESTL: SCOPE
5177
5178  033300                  EXPAN3:                                 ;EXTENDED MEMORY RETURNS HERE AFTER BEING EXECUT
5179
5180  033300  012767  004000  145530          MOV     #4000,ICOUNT
5181                                  .SBTTL  BACKGROUND OVERLAY CALL
5182
5183  033306  016767  144464  144506          MOV     PS,IOTLVL               ;SERVICE OVERLAY AT CURRENT PROCESSOR
5184                                                                          ;STATUS AND MODE
5185  033314  016767  144500  145542          MOV     IOTVEC,RETURN           ;SET UP NEW SCOPE POINTER
5186
5187                                    ;THE NEXT INSTRUCTION IS THE CALL TO A USER BACKGROUND OVERLAY
5188                                    ;THE USER MUST SET UP THE IOT VECTOR TO GET TO HIS PROGRAM
5189
5190  033322  000004                          IOT
5191
```

```
                                        ;SBTTL  ASTERISK ON PASS COMPLETE
                                        BELL1:  JSR     PC,HSPLSP               ;DETERMINE IF OUTPUT TO TTY OR HSP
 033324  004767  001532                 BIT     #100,@TCSR              ;IF OUTPUT DEVICE IS RUNNING
 033330  032777  000100  001400         BNE     ENDPAS                  ;DO NOT SEND BELL
 033336  001025                         TSTB    @TCSR                   ;WAIT FOR FLAG; MAKE SURE NOT BUSY
 033340  105777  001572                 BPL     .-4
 033344  100375                         MOV     #215,@TDBR              ;OUTPUT CR
 033346  012777  000215  001560         TSTB    @TCSR
 033354  105777  001556                 BPL     .-4
 033360  100375                         MOV     #212,@TDBR              ;OUTPUT LF
 033362  012777  000212  001544         TSTB    @TCSR
 033370  105777  001542                 BPL     .-4
 033374  100375                         MOV     #'*,@TDBR               ;OUTPUT ASTERISK CODE
 033376  012777  000052  001530         TSTB    @TCSR                   ;WAIT FOR DONE
 033404  105777  001526                 BPL     .-4
 033412  100375
                                        ;SBTTL  END OF PASS
                                        ;END OF PASS SERVICE
                                        ;CHECK FOR EXIT TO EXTERNAL MONITOR
                                        ;CHECK FOR BUS SWITCH RELEASE
                                        ;CHECK FOR ISOLATION
                                        ;CHECK FOR PROCESSOR MODE CHANGE
                                        ;CHECK FOR USE OF KT11
 033412  016767  144360  002274 ENDPAS1: MOV     PS,TEMP                 ;SAVE CURRENT  PROCESSOR STATUS
 033420  005067  144352                 CLR     PS                      ;CLEAR PS (EXCEPT TRACE BIT)
 033424  132767  000010  145431         BITB    #10,CONFIG+1            ;IF SEGMENTATION IS AVAILABLE
 033432  001402                         BEQ     .+6                     ;TURN IT OFF
 033434  005067  144132                 CLR     SSR0
 033440  013701  000042                 MOV     @#42,R1                 ;GET CONTENTS OF LOC 42
 033444  001426                         BEQ     ENDP1                   ;BRANCH IF NOT QUICK VERIFY OR AUTO ACCEPT
 033446  105767  145415                 TSTB    DVFLG                   ;IS THIS AUTO ACCEPT?
 033452  001423                         BEQ     ENDP1                   ;YES- BRANCH ;CONT IF DV
 033454  000005                 EXIT1:  RESET
 033456  012767  000137  144514         MOV     #137,200                ;RESTORE 200
 033464  012767  001542  144510         MOV     #BEGIN1,202             ;AND 202
 033472  012706  036322                 MOV     #STACKK,SP              ;RESTORE STACK
 033476  005046                         CLR     -(SP)                   ;SET UP TO CLEAR  T BIT
 033500  012746  033506                 MOV     #LOGICAL,-(SP)          ;BY RTI, GO TO LOGICAL
 033504  000002                         RTI
 033506  004711                 LOGICAL:JSR     PC,(R1)                 ;RETURN TO MONITOR
 033510  000240                         NOP                             ;FOR ACT11
 033512  000240                         NOP
 033514  000240                         NOP
 033516  000137  000200                 JMP     @#200                   ;DDP RETURN TO START
 033522  005767  001762         ENDP1:  TST     ISFLG                   ;IF ISOLATION IS SELECTED
 033526  001403                         BEQ     ENDP2
 033530  104000                         HLT                             ;TYPE STATUS OF SYSTEM
 033532  004767  001562                 JSR     PC,ISOLAT               ;ISOLATE NEXT DEVICE
 033536  005267  000566         ENDP2:  INC     PASCT
 033542  005267  145274                 INC     PASCNT                  ;INCREMENT PASS COUNT
 033546  016767  145270  144014         MOV     PASCNT,LIGHTS           ;DISPLAY PASS COUNT
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 033554  012706  036322                 MOV     #STACKK,SP              ;SET EXEC STACK POINTER
 033560  005046                         CLR     -(SP)                   ;PRESET 'NEW' STATUS.
 033562  005767  144254                 TST     42                      ;IF 42=0, HIGH SPEED DUMP
 033566  001407                         BEQ     ENDPAX
 033570  026767  000534  000530         CMP     PASCT,PASEX             ;IF AUTO ACCEPT OR DDP CHAIN MODE,
 033576  001003                         BNE     ENDPAX                  ;BRANCH IF NOT ALL MODES HAVE BEEN TESTED
 033600  005067  000524                 CLR     PASCT                   ;ALL MODES HAVE BEEN RUN- GO TO THE
 033604  000723                         BR      EXIT                    ;MONITOR RETURN
 033606  032767  010000  143754 ENDPAX1: BIT     #10000,SR               ;FREEZE IN CURRENT MODE?
 033614  001403                         BEQ     ENDPA1                  ;NO- BRANCH
 033616  016716  002002                 MOV     TEMP,(SP)               ;YES- SET UP TO RESTART WITH
 033622  000424                         BR      DTREL                   ;CURRENT STATUS
 033624  016700  000500         ENDPA1: MOV     PASCT,R0
 033630  020067  000472                 CMP     R0,PASEX
 033634  002403                         BLT     1$
 033636  005067  000466                 CLR     PASCT
 033642  005000                         CLR     R0
 033644  006300                 1$:     ASL     R0                      ;CALCULATE OFFSET
 033646  066700  000452                 ADD     PASPAR,R0               ;GET TABLE STARTING ADDRESS
 033652  011016                         MOV     (R0),(SP)               ;LOAD PARAMETERS IN 'NEW' STATUS
 033654  026727  145162  000002         CMP     PASCNT,#2               ;IF LESS THAN 2 PASSES COMPLETE
 033662  103404                         BLO     DTREL                   ;DON'T ALLOW KT11
 033664  032767  000040  145156         BIT     #40,SR3                 ;KT11 INHIBITED?
 033672  001450                         BEQ     SEGOPT                  ;NO- GO TURN ON IF AVAILABLE
 033674  032767  000002  145142 DTREL1: BIT     #2,SR1                  ;CHECK FOR MULTIPROCESSORS
 033702  001037                         BNE     NOOPT                   ;BRANCH AROUND IF SET
 033704  000005                         RESET                           ;RELEASE SWITCH
 033706  005027  033710                 CLR     #BUSWT                  ;ALLOW OTHER PROCESSOR TO REQUEST SWITCH
                 033710                  BUSWT=.-2
 033712  005337  177772                 DEC     BUSWT
 033716  001375                         BNE     .-4
 033720  032777  020000  145252         BIT     #20000,@DTCSR1          ;MONITOR NON-NEUTRAL BIT
 033726  001374                         BNE     .-6                     ;WAIT FOR IT TO CLEAR
 033730  012777  000001  145242         MOV     #1,@DTCSR1              ;REQUEST SWITCH
 033736  105777  145236                 TSTB    @DTCSR1                 ;WAIT FOR IT TO CONNECT
 033742  100375                         BPL     .-4
 033744  005067  001654                 CLR     TEMP                    ;DELAY FOR DEVICES
 033750  005267  001650                 INC     TEMP                    ;TO INITIALIZE
 033754  001375                         BNE     .-4
 033756  032777  001000  145214         BIS     #1000,@DTCSR1           ;ISSUE SWITCHED BUS INIT
 033764  032777  001000  145206         BIT     #1000,@DTCSR1           ;WAIT FOR INIT TO FINISH
 033772  001374                         BNE     .-6
 033774  012746  022452                 MOV     #STA,-(SP)              ;SWITCH IS CONNECTED - RESTART PROGRAM
 034000  000402                         BR      EXOPT
 034002  012746  014606         NOOPT:  MOV     #PROGTS,-(SP)           ;RESTART
 034006  000002                 EXOPT:  RTI                             ;PROGRAM
                                        ;RETURN TO PROGRAM FROM TRAP
 034010  000002                 TRTRET: RTI
 034012  000000                         HALT                            ;RTI FAILED
                                        TRTVEC=14                       ;TRACE TRAP VECTOR
                                        ;KT11 OPTION
 034014  132767  000010  145041 SEGOPT: BITB    #10,CONFIG+1            ;CHECK IF AVAILABLE
```

```
                                        REQ     DTREL                   ;RETURN IF NOT AVAILABLE
                                        CLR     SSR0                    ;DISABLE IF ON
                                        BIT     #1,CONFIG               ;IF PROCESSOR IS PDP-11/40
                                        REQ     SEG40                   ;MAP FOR 11/40
                                        JSR     R5,MAP                  ;MAP FOR PDP-11/45
                                        6
                                        UISAR0
                                        UDSAR0
                                        SISAR0
                                        SDSAR0
                                        KISAR0
                                        KDSAR0
                                        JSR     R5,MAPA
                                        6
                                        UISDR0
                                        UDSDR0
                                        SISDR0
                                        SDSDR0
                                        KISDR0
                                        KDSDR0
                                        RR      SEGALL
SEG40:  JSR     R5,MAP                  ;MAP FOR 11/40
                                        2
                                        UISAR0
                                        KISAR0
                                        JSR     R5,MAPA
                                        2
                                        UISDR0
                                        KISDR0
SEGALL: MOV     #SEGERR,SEGVEC          ;LOAD KT11 ERROR VECTOR
                                        CLR     SEGVEC+2
                                        INC     SSR0                    ;ENABLE KT11
                                        RR      DTREL                   ;RETURN

                                KT11 ERROR
SEGERR: MOV     SSR0,SSR0T              ;SAVE SSR0 INDICATORS
                                        MOV     #7,SSR3                 ;ENABLE 0 SPACES
                                        MOV     #1,SSR0                 ;CLEAR FLAGS
                                        JMP     SEGLVL                  ;GO HALT
SSR0T:  0                               ;KT11 ERROR FLAGS ARE SAVED HERE

                                KT11 REGISTER ADDRESSES
                                SSR0=177572
                                SSR3=172516
                                UISDR0=177600
                                UDSDR0=177620
                                UISAR0=177640
                                UDSAR0=177660
                                SISDR0=172200
                                SDSDR0=172220
                                SISAR0=172240
                                SDSAR0=172260
                                KISDR0=172300
                                KDSDR0=172320
```



```
                                KISAR0=172340
                                KDSAR0=172360

                                ;SETUP KT11 REGISTERS
MAP:    MOV     (R5)+,R2
MAP1A:  MOV     (R5)+,R0                ;GET ADDRESS OF PAR TO BE SET UP
        MOV     #7,R1                   ;GET REGISTER COUNT
        CLR     R3
        MOV     #200,R4

MAP11:  MOV     R3,(R0)+                ;LOAD PAR
        ADD     R4,R3                   ;SETUP TO LOAD NEXT PAR
        SOB     R1,MAP1                 ;LOAD NEXT PAR IF NOT DONE
        MOV     #7600,(R0)+             ;SET LAST PAR
        SOB     R2,MAP1A                ;GET NEXT GROUP
        RTS     R5

MAPA:   MOV     (R5)+,R2
MAP2A:  MOV     (R5)+,R0                ;GET PDR ADDRESS
        MOV     #8.,R1

MAP2:   MOV     #77406,(R0)+            ;PDR= 4K R/W UP
        SOB     R1,MAP2
        SOB     R2,MAP2A
        RTS     R5                      ;EXIT

                                ;PDP-11/45 PASS PARAMETER TABLE

PAS45:  000000                          ;STATUS =0
        000020                          ;THE 'T' BIT
        004000                          ;THE REGISTER SET BIT
        004020                          ;REGISTER SET & T BIT
        040000                          ;SUPERVISOR MODE
        040020                          ;SUPERVISOR MODE & T BIT
        044000                          ;SUPERVISOR & REG SET
        044020                          ;SUPERVISOR,REG SET & 'T' BIT
        140000                          ;USER MODE
        140020                          ;USER MODE & 'T' BIT
        144000                          ;USER MODE, REG SET
        144020                          ;USER MODE,REG SET & 'T' BIT

                                ;PDP-11/40 PASS PARAMETER TABLE

PAS40:  000000
        000020
        140000
        140020

                                ;PDP-11/10,20 PASS PARAMETER TABLE

PAS20:  000000
        000020

PASPAR: 0                               ;POINTER TO PASS PARAMETER TABLE
```

```
5408  *34326  *00000                PASEXT: 0                       ;PASS COMPLETE COUNT
5409  *34330  *00000                PASCT:  0
5410  *34332  *34320                PASTAB: PAS2*
5411  *34334  *34320                        PAS2*
5412  *34336  *34310                        PAS4*
5413  *34340  *34200                        PAS5
5414  *34342  *00002                EXITCT: 2
5415  *34344  *00002                        2
5416  *34346  *00004                        4
5417  *34350  *00014                        14
5418
5419                                .SBTTL  ERROR HANDLER*
5420
5421                                ;ENTERED WITH SYSTEM TRAP CALL(ERROR) AT LEVEL 7
5422                                ;PRINT OUT THE ERROR INFORMATION
5423  *34352  *05767  144462        PRINT:  TST     PRFLAG                  ;IS ROUTINE BUSY
5424  *34356  *01401                        BEQ     .+4
5425  *34360  *00002                        RTI                             ;YES IT IS BUSY
5426  *34362  *05267  144452                INC     PRFLAG                  ;PRINT ROUTINE BUSY
5427  *34366  *42767  *00140  143402        BIC     #140,PS                 ;DROP TO LEVEL 4
5428  *34374  *36727  143170  *20000        BIT     SR,#2000*               ;TEST FOR INHIBIT PRINT OUT
5429  *34402  *01401                        BEQ     .+4                     ;BRANCH TO PRINT
5430  *34404  *00477                        BR      PRINT1                  ;INHIBIT, RETURN TO MAIN STREAM
5431  *34406  *10667  *00312                MOV     SP,SAVSPA
5432  *34412  *11667  *00322                MOV     (SP),SAVPC              ;PC OF FAILING ROUTINE
5433  *34416  *16667  *00002  *00316        MOV     2(SP),SAVPS             ;PS OF ERROR CONDITION
5434  *34424  *04767  *00232                JSR     PC,HSPLSP
5435  *34430  *05777  *00302                TSTB    *TCSR
5436  *34434  *00375                        BPL     .+4
5437  *34436  *12777  *00215  *00270        MOV     #215,*TDBR              ;CR
5438  *34444  *05777  *00266                TSTB    *TCSR
5439  *34450  *00375                        BPL     .+4
5440  *34452  *12777  *00212  *00254        MOV     #212,*TDBR              ;LINE FEED
5441  *34460  *10267  *00242                MOV     R2,SAVR2                ;SAVE R2
5442  *34464  *10367  *00240                MOV     R3,SAVR3                ;SAVE R3
5443  *34470  *10467  *00236                MOV     R4,SAVR4                ;SAVE R4
5444  *34474  *16702  *00240                MOV     SAVPC,R2
5445  *34500  *04767  *00240                JSR     PC,PRTAB                ;PRINT OCTAL NUMBER
5446  *34504  *16702  *00232                MOV     SAVPS,R2
5447  *34510  *04767  *00230                JSR     PC,PRTAB                ;PRINT OCTAL NUMBER
5448  *34514  *16702  144344                MOV     RETURN,R2               ;CPU TEST ID
5449  *34520  *04767  *00220                JSR     PC,PRTAB
5450  *34524  *12702  *36520                MOV     #STACK,R2
5451  *34530  *166702 *00170                SUB     SAVSPA,R2               ;HOW FAR STACK POSITIVE
5452  *34534  *04767  *00204                JSR     PC,PRTAB
5453  *34540  *13702  *01044        PREG1:  MOV     @#SR1,R2                ;PRINT SR1
5454  *34544  *04767  *00174                JSR     PC,PRTAB
5455  *34550  *13702  *01046        PREG2:  MOV     @#SR2,R2                ;PRINT SR2
5456  *34554  *04767  *00164                JSR     PC,PRTAB
5457  *34560  *13702  *01050        PREG3:  MOV     @#SR3,R2
5458  *34564  *04767  *00154                JSR     PC,PRTAB
5459  *34570  *16702  *00132*               MOV     SAVR2,R2                ;RESTORE REGISTERS
5460  *34574  *16703  *00130                MOV     SAVR3,R3
5461  *34600  *16704  *00126                MOV     SAVR4,R4
```



```
5462  *34604  *05767  142760        PRINT1: TST     SR                      ;TEST FOR HALT SWITCH
5463  *34610  *00005                        BPL     PRINT2
5464  *34612  *10046                        MOV     R0,-(SP)                ;SAVE R0 ON STACK
5465  *34614  *16700  *00120                MOV     SAVPC,R0
5466  *34620  *00000                        HALT                            ;HALT ON ERROR SET
5467  *34622  *12620                        MOV     (SP)+,R0
5468  *34624  *32767  *00400  142736 PRINT2: BIT     #400,SR
5469  *34632  *01402                        BEQ     .+6
5470  *34634  *04767  *00460                JSR     PC,ISOLATE
5471  *34640  *32767  *00100  142722        BIT     #100,SR
5472  *34646  *01003                        BNE     PRINT3
5473  *34650  *05067  144164                CLR     PRFLAG                  ;CLEAR PRINT ROUTINE BUSY
5474  *34654  *00002                        RTI                             ;RETURN TO MAIN STREAM
5475  *34656  *00137  *02352        PRINT3: JMP     @#ST                    ;TO RESTART PROG
5476
5477  *34662  *16767  144216  *00046 HSPLSP: MOV     TTCSR,TCSR
5478  *34670  *16767  144212  *00036        MOV     TTDBF,TDBR
5479  *34676  *36727  142686  *00200        BIT     SR,#200
5480  *34704  *01406                        BEQ     HPLPEX
5481  *34706  *16767  144202  *00022        MOV     HPCSP,TCSR
5482  *34714  *16767  144176  *00012        MOV     HPDBP,TDBR
5483  *34722  *00207                HPLPEX: RTS     PC
5484  *34724  *00000                SAVSPA: 0
5485  *34726  *00000                SAVR2:  0
5486  *34730  *00000                SAVR3:  0
5487  *34732  *00000                SAVR4:  0
5488  *34734  *177566               TDBR:   177566                          ;DATA
5489  *34736  *177564               TCSR:   177564                          ;PS
5490  *34740  *00000                SAVPC:  0
5491  *34742  *00000                SAVPS:  0
5492
5493                                ;CONVERT DATA TO ASCII AND TYPE
5494
5495  *34744  *12704  *35070        PRTAB:  MOV     #LISTND,R4              ;SET UP POINTER TO DATA STORAGE
5496  *34750  *12747  *00006  *00074        MOV     #6,ASCNT                ;6 DIGITS WILL BE EXTRACTED
5497  *34756  *11203                PRTAB1: MOV     R2,R3                   ;GET DATA TO BE CONVERTED
5498  *34760  *42703  177770                BIC     #177770,R3              ;EXTRACT 1 OCTAL DIGIT
5499  *34764  *062703 *00260                ADD     #260,R3                 ;CONVERT TO ASCII
5500  *34770  *10344                        MOV     R3,-(R4)                ;SAVE ASCII DIGIT
5501  *34772  *006202                       ASR     R2                      ;POSITION NEXT DIGIT
5502  *34774  *006202                       ASR     R2                      ;TO BE EXTRACTED
5503  *34776  *006202                       ASR     R2
5504  *35002  *005367 *00046                DEC     ASCNT                   ;IF ALL DIGITS HAVE NOT BEEN
5505  *35004  *001364                       BNE     PRTAB1                  ;EXTRACTED, CONTINUE
5506  *35006  *042714 *00006                BIC     #6,(R4)
5507  *35012  *012767 *00007  *00032 XLIST: MOV     #7,ASCNT                ;SEND 7 CHAR TO TTY
5508  *35020  *105777 177712        WAIT2:  TSTB    @TCSR
5509  *35024  *100375                       BPL     WAIT2
5510  *35026  *012477 177702                MOV     (R4)+,@TDBR
5511  *35032  *005367 *00014                DEC     ASCNT
5512  *35036  *001401                       BEQ     HDFHM                   ;FINISH PRINTING GET NXT NUM
5513  *35042  *000767                       BR      WAIT2
5514  *35042  *105777 177670        HDFHM:  TSTB @TCSR
5515  *35046  *100375                       BPL     .-4
```

```
 5516  035050  000207                    RTS     PC                      ;HEAD FOR HOME
 5517  035052  000000          ASCNT:  0
 5518  035054  000000          LIST:   0
 5519  035056  000000                  0
 5520  035060  000000                  0
 5521  035062  000000                  0
 5522  035064  000000                  0
 5523  035066  000000                  0
 5524  035070  000240          LISTND: 240                             ;SEPARATOR
 5525
 5526                          ;SCOPE LOOP ROUTINE ENTERED BY USER TRAP
 5527  035072  016716  143766  SCOPEB: MOV     RETURN,(SP)             ;SET UP FOR NEXT TEST
 5528  035076  005767  155050  SCOPET: TST     TCFLAG                  ;DECTAPE DATA
 5529  035102  001402                  BEQ     .+6                     ;BRANCH IF NO NEW DATA
 5530  035104  004767  000004          JSR     PC,TC1                  ;CHECK TC DATA
 5531                                                                  ;SPECIAL SERVICE CODE
 5532  035110  004767  000130          JSR     PC,TWAIT                ;CHECK INHIBIT PROCESSOR SWITCH
 5533  035114  000002                  RTI                             ;SCOPE RETURN
 5534
 5535
 5536                          .SBTTL  SCOPE LOOP ROUTINE
 5537
 5538  035116  032767  040000  142444  SCOPEC: BIT     #40000,SR               ;TEST FOR LOOP
 5539  035124  001362                  BNE     SCOPEB                  ;YES SCOPE
 5540  035126  105767  143735          TSTB    OVFLG                   ;IF OVFLG NOT 0
 5541  035132  001015                  BNE     SCOPEA                  ;NO ITERATIONS OF TEST
 5542  035134  032767  004000  142426  BIT     #4000,SR                ;NO = TEST FOR ITERATION
 5543  035142  001007                  BNE     SCOPEC                  ;INHIBIT ITERATION
 5544  035144  026767  143710  143664  CMP     SCOPEF,ICOUNT
 5545  035152  001403                  BEQ     SCOPEC                  ;EXIT = DONE
 5546  035154  005267  143700          INC     SCOPEF                  ;INCREMENT COUNT
 5547  035160  000744                  BR      SCOPEB                  ;LOOP SOME MORE
 5548  035162  005067  143672  SCOPEC: CLR     SCOPEF                  ;CLEAR COUNT
 5549  035166  016A67  143672  SCOPEA: MOV     @SP,RETURN              ;SAVE SCOPE RETURN POINTER
 5550  035172  000002                  RTI                             ;RETURN INLINE=NEXT TEST
 5551
 5552                          ;THIS ROUTINE CHECKS THE READ DATA BUFFER TC11
 5553                          ;BY DOING A CHECK SUM ON THE DATA
 5554  035174  005067  154752  TC1:    CLR     TCFLAG                  ;SET BY TC READ ROUTINE
 5555  035200  010146                  MOV     R1,-(SP)                ;SAVE THESE ON THE STACK
 5556  035202  010246                  MOV     R2,-(SP)
 5557  035204  010346                  MOV     R3,-(SP)
 5558  035206  005003                  CLR     R3                      ;SUM OF DATA
 5559  035210  012701  012750          MOV     #TCRBUF,R1              ;ADDRESS OF READ BUFFER
 5560  035214  012702  013750          MOV     #TCRBUF+1000,R2         ;END OF READ BUFFER
 5561  035220  062103          TC2:    ADD     (R1)+,R3                ;EVEN ADD
 5562  035222  062103                  ADD     (R1)+,R3                ;ODD ADD =2'S COMPLIMENT
 5563  035224  001775                  BEQ     TC2
 5564  035226  020102                  CMP     R1,R2                   ;AT END OF BUFFER?
 5565  035230  101001                  BHI     .+4                     ;YES=BRANCH
 5566  035232  104000                  HLT                             ;DATA ERROR
 5567  035234  012603                  MOV     (SP)+,R3                ;RESTORE THE REGISTERS
 5568  035236  012602                  MOV     (SP)+,R2
 5569  035240  012601                  MOV     (SP)+,R1
```



```
 5570  035242  000207                    RTS     PC                      ;EXIT
 5571  035244          TWAIT:
 5572  035244  032767  002000  142316          BIT     #2000,SR
 5573  035252  001402                  BEQ     EWAIT
 5574  035254  000001                  WAIT                            ;WAIT HERE FOR INTERRUPTS
 5575  035256  000772                  BR      TWAIT
 5576  035260  000207          EWAIT:  RTS     PC                      ;EXIT WAIT LOOP
 5577
 5578                          ;GROUP OF NESTED SUBROUTINES
 5579  035262  000207          SUBR1A: RTS     PC                      ;ONE INSTRUCTION
 5580  035264  000277          SUBR2A: SCC                             ;ONE DEEP
 5581  035266  000207                  RTS     PC
 5582  035270  004767  177770  SUBR3A: JSR     PC,SUBR2A               ;TWO DEEP
 5583  035274  000207                  RTS     PC
 5584  035276  004767  177766  SUBR4A: JSR     PC,SUBR3A               ;THREE DEEP
 5585  035302  000207                  RTS     PC
 5586  035304  004767  177766  SUBR5A: JSR     PC,SUBR4A               ;FOUR DEEP
 5587  035310  000207                  RTS     PC
 5588  035312  004767  177766  SUBSPA: JSR     PC,SUBR5A               ;FIVE DEEP
 5589  035316  000207                  RTS     PC
 5590
 5591                          .SBTTL  ISOLATION ROUTINE
 5592
 5593                          ;THIS ROUTINE ON ERROR DETECTION OR END OF PASS OF
 5594                          ;PROCESSOR TEST WILL DELETE ONE DEVICE OF THOSE THAT
 5595                          ;HAVE BEEN SELECTED TO RUN, ON ENTERING THIS ROUTINE
 5596                          ;THE CURRENTLY DELETED ONE WILL BE RESTORED AND A
 5597                          ;NEW DEVICE DELETED.
 5598
 5599  035320  032767  000400  142242  ISOLAT: BIT     #400,SR                 ;IS ISOLATION REQUESTED
 5600  035326  001015                  BNE     ISOLA1
 5601  035330  005767  000154          TST     ISFLG                   ;WAS ISOLATION IN PROGRESS
 5602  035334  001411                  BEQ     ISOLA2                  ;IF NOT EXIT
 5603  035336  016705  000144          MOV     ISCNT,R5                ;RESTORE LAST DELETED DEVICE
 5604  035342  046765  000144  001044  BIC     ISWRD,SR1(R5)
 5605  035352  005067  000134          CLR     ISFLG                   ;CLEAR ISOLATION FLAG
 5606  035356  000167  144772          JMP     ST                      ;RESTART ALL SELECTED DEVICES
 5607  035360  000207          ISOLA2: RTS     PC
 5608  035362  005767  000122  ISOLA1: TST     ISFLG                   ;HAS ROUTINE BEEN ENTERED BEFORE
 5609  035366  001012                  BNE     ISO2
 5610  035370  012767  000001  000112  MOV     #1,ISFLG                ;SET FLAG
 5611  035376  005067  000124  ISO1:   CLR     ISCNT
 5612  035402  012767  000004  000122  MOV     #4,ISWRD
 5613  035410  005005                  CLR     R5
 5614  035412  000410                  BR      ISO4
 5615  035414  016705  000066  ISO2:   MOV     ISCNT,R5                ;SET UP TO ACCESS DEVICE SELECTION REGISTER
 5616  035420  046765  000066  001044  BIC     ISWRD,SR1(R5)           ;RESTORE PREVIOUSLY DELETED DEVICE
 5617  035426  006367  000060  ISO3:   ASL     ISWRD                   ;SET UP TO DELETE NEW DEVICE
 5618  035432  001411                  BEQ     ISO5                    ;IF WORD =0, RESET
 5619  035434  036765  000052  001044  BIT     ISWRD,SR1(R5)           ;IF DEVICE NOT SELECTED
 5620  035442  001371                  BNE     ISO3                    ;DO NOT DESELECT
 5621  035444  056765  000042  001044  BIS     ISWRD,SR1(R5)           ;DESELECT DEVICE
 5622  035452  000167  144674          JMP     ST                      ;RESTART TEST
 5623  035456  062767  000002  000022  ISO5:   ADD     #2,ISCNT                ;INDEX FOR NEXT SR
```

```
 9624  035464  026727  000016  000006          CMP     ISCNT,#6                ;IF AFTER LAST SR
 9625  035472  001741                          BEQ     ISO1                    ;RESTART SEQUENCE
 9626  035474  005267  000012                  INC     ISWRD                   ;SET UP TO ISOLATE 1 DEVICE
 9627  035500  016705  000002                  MOV     ISCNT,R5
 9628  035504  000753                          BR      ISO4                    ;START ISOLATION
 9629  035506  000000          ISCNT:  0
 9630  035510  000000          ISFLG:  0
 9631  035512  000000          ISWRD:  0
 9632
 9633                                          ;ENTER HERE ON POWER FAILURE
 9634
 9635
 9636  035514  012767  000001  000046  PFAIL:  MOV     #1,PFFLAG               ;SET POWER FAIL FLAG
 9637  035522  012767  035532  142274          MOV     #RESTART,24             ;SET UP FOR POWER UP TRAP
 9638  035530  000000                          HALT                            ;HALT ON POWER DOWN NORMAL
 9639
 9640                                          ;PROCESSOR WILL TRAP HERE WHEN POWER IS RESTORED
 9641
 9642  035532  012706  036520          RESTART: MOV    #STACK,SP               ;RESTORE STACK
 9643  035536  012767  035514  142260          MOV     #PFAIL,24               ;SET UP FOR POWER FAILURE
 9644  035544  005067  143270                  CLR     PRFLAG
 9645  035550  005067  000050                  CLR     TEMP
 9646  035554  005267  000044                  INC     TEMP
 9647  035560  001375                          BNE     .-4
 9648  035562  104000                          HLT                             ;REPORT POWER FAILURE
 9649  035564  000167  157016                  JMP     PROCTS                  ;START PROCESSOR TEST
 9650  035570  000000          PFFLAG: 0.
 9651  035572  125252          B:      125252
 9652
 9653                                          .SBTTL  FIXED VALUES AND TEMPORARY STORAGE FOR PROCESSOR TEST
 9654
 9655  035574  035572                          B                               ;ADDRESS OF B
 9656  035576  052525                          052525
 9657
 9658          035602                  .=B+10
 9659  035602  177777          A:      -1
 9660  035604  035606                          A+4
 9661
 9662          035606                  .=A+4
 9663  035606  125252                          125252
 9664  035610  035612                          A+10                            ;ADDRESS OF A+10
 9665  035612  052525                          052525
 9666  035614  000000          C:      0
 9667  035616  035614                          C                               ;ADDRESS OF C
 9668
 9669          035624                  .=C+10
 9670  035624  000000          TEMP:   0
 9671  035626  035624                          TEMP                            ;ADDRESS OF TEMP
 9672
 9673          035632                  .=TEMP+6
 9674  035632  035634                          TEMP+10                         ;ADDRESS OF TEMP+10 OR MORE
 9675  035634  000000          D:      0
 9676
 9677                                          .SBTTL  FLOATING POINT CONSTANTS AND DATA
```



```
 9678
 9679  035636  177777                  D1012:  -1
 9680  035640  000000  177777  000000  D0101:  0,-1,0
 9681  035646  177777  000000  000000  D1001:  -1,0,0
 9682  035654                  DSMALL:
 9683  035654  177777  000001  000000  WEIRD:  -1,1,0,-1
 9684  035662  177777
 9685  035664  035640                  AD0101: D0101
 9686  035666  035646                  AD1201: D1201
 9687  035670  036006                  AD1000: D1000
 9688  035672  077777  000000  177777  DBIG:   77777,0,-1,0
 9689  035700  000020
 9690  035702  100000  000000  000000  DMZERO: 100000,0,0,0
 9691  035710  200000
 9692  035712  036070                  AANS1:  ANS1
 9693  035714  040252  125252  125252  DALTA:  40252,125252,125252,125252
 9694  035722  125252
 9695  035724  040325  052525  052525  DALTR:  40325,52525,52525,52525
 9696  035732  052525
 9697  035734  040325  052525  052525  DALTC:  40325,52525,52525,52526
 9698  035742  052526
 9699  035744  040000  000000  000000  D4:     40000,0,0,0
 9700  035752  000000
 9701  035754  037400  000000  000000  D37:    37400,0,0,0
 9702  035762  000000
 9703  035764  040600  000000  000000  D46:    40600,0,0,0
 9704  035772  000000
 9705  035774  040200  000000  000000  D20:    20000,0,0,0
 9706  036002  000000
 9707  036004  000000                  D0122:  0
 9708  036006  177777  000000  000000  D1000:  -1,0,0,0
 9709  036014  000000
 9710  036016  000120  000000  000000  D0100X: 100,0,0
 9711  036024  000000  177777  177777  D0111:  0,-1,-1,-1
 9712  036032  177777
 9713  036034  000000  054321          D5T01:  0,54321
 9714  036040  036034                  AD5T01: D5T01
 9715  036042  043601  121000  000000  F5T01:  43601,121000,0,0
 9716  036050  000000
 9717  036052  000000                  SAVADR: 0
 9718  036054  000000                  SAVSTS: 0
 9719  036056  170200                  FLTERR: STEPS   FPS
 9720  036060  170367  000024                  STST    FEC
 9721  036064  104000                          HLT
 9722  036066  000002                          RTI
 9723  036070  000000                  ANS1:   0                               ;FIRST ANSWER (SEE CODE)
 9724  036072  000000                  ANS2:   0
 9725  036074  000000                  ANS3:   0
 9726  036076  000000                  ANS4:   0
 9727  036100  000000                  ANS5:   0
 9728  036102  000000                  ANS6:   0
 9729  036104  000000                  ANS7:   0
 9730  036106  000000                  ANS8:   0
 9731  036110  000000                  FEC:    0                               ;FLOATING EXCEPTION CODES
```

```
 9732  036112  000000                FEA:  0                         ;FLOATING EXECPTION ADDRESS
 9733  036114  000000                ,TYPE:  0
 9734  036116  000000                FPERF:  0
 9735
 9736  036120  172160                FPSADR:  172160                 ;FLOATING POINT ADDRESS ON THE 11/20
 9737  036122  000244  000246        FPVECT:  244,246                ;FLOATING POINT VECTOR ADDRESS
 9738          036322                ,=.+174
 9739  036322  000000                STACK1:  0                      ;BUFFER FOR SP
 9740          036520                ,=.+174
 9741  036520  000000                STACK:  0                       ;GENERAL STACK
 9742
 9743                                ;TEXT FOR AA11 DAC WITH SCOPE OPTION
 9744                                ;TEXT = "PDP11"
 9745  036522  036536                TEXT:  P
 9746  036524  036543                       XD
 9747  036526  036536                       P
 9748  036530  036550                       DASH
 9749  036532  036555                       N1
 9750  036534  036555                       N1
 9751  036536     177     011     011  P1:     ,BYTE 177,11,11,11,6
 9752  036541     011     006
 9753  036543     177     101     101  XD:     ,BYTE 177,101,101,101,76
 9754  036546     171     076
 9755  036550     000     010     010  DASH:   ,BYTE 0,10,10,10,0
 9756  036553     010     000
 9757  036555     000     102     177  N1:     ,BYTE 0,102,177,100,0
 9758  036560     100     000
 9759                                ,EVEN
 9760  036562  000000                AAR0:  0                        ;AA11 (ROW)
 9761  036564  000000                AAR1:  0                        ;AA11 COLUMN
 9762  036566  000000                AAR2:  0                        ;CHARACTER POINTER
 9763  036570  000000                AAR3:  0                        ;HOLDS CHARACTER
 9764  036572  000000                YPOS:  0
 9765  036574  000000                XPOS:  0
 9766  036576  000000                YPT:  0
 9767  036600  000000                PNTR:  0
 9768  036602  000000                CNTR:  0
 9769
 9770
 9771
 9772                                ;SIZER FOR FIXED VECTOR DEVICES
 9773                                ;DETERMINE WHAT FIXED VECTOR DEVICES ARE ON SYSTEM
 9774                                ;AND CLEAR BIT IN DEVICE SELECTION REGISTER CORRESPONDING
 9775                                ;TO THAT DEVICE
 9776
 9777  036604  012705  036730        SIZER:  MOV     #DEVTAB,R5      ;GET TABLE OF DEVICES TO BE CHECKED
 9778  036610  012767  177777  142226        MOV     #177777,SR1
 9779  036616  012767  177777  142222        MOV     #177777,SR2
 9780  036624  012767  177777  142216        MOV     #177777,SR3
 9781  036632  012737  036720  000004        MOV     #5$,@#4         ;SET UP POINTER FOR
 9782  036640  012737  000340  000006        MOV     #340,@#6        ;NON-EXISTENT DEVICE TIMEOUT
 9783  036646  005001                CLR     R1
 9784  036650  005002                CLR     R2
 9785  036652  005735                1$:     TST     @(R5)+          ;IF DEVICE EXISTS, NO
```



```
 9786                                                                ;TIMEOUT WILL OCCUR
 9787  036654  112501                        MOVB    (R5)+,R1        ;GET OFFSET TO DEVICE SELECTION
 9788                                                                ;REGISTER
 9789  036656  012703  000001                MOV     #1,R3           ;SET UP TO SELECT DEVICE
 9790  036662  112502                        MOVB    (R5)+,R2        ;GET POSITION OF DEVICE SELECT BIT
 9791  036664  001403                2$:     BEQ     3$              ;WHEN BIT IS IN CORRECT POSITION
 9792  036666  006303                        ASL     R3              ;POSITION BIT
 9793  036670  005302                        DEC     R2
 9794  036672  000774                        BR      2$
 9795  036674  040361  001044        3$:     BIC     R3,SR1(R1)
 9796  036700  005715                4$:     TST     (R5)            ;AT END OF TABLE ?
 9797  036702  001363                        BNE     1$
 9798  036704  012737  000006  000004        MOV     #6,@#4
 9799  036712  005037  000006                CLR     @#6
 9800  036716  000207                        RTS     PC
 9801  036720  005725                5$:     TST     (R5)+
 9802  036722  022626                        CMP     (SP)+,(SP)+
 9803  036724  000765                        BR      4$
 9804  036726  001044                STORE:  SR1
 9805  036730                        DEVTAB:
 9806  036730  177546                ,WORD   177546                  ;KW11-L
 9807  036732     000     004        ,BYTE   0,4
 9808  036734  172540                ,WORD   172540                  ;KW11-P
 9809  036736     000     006        ,BYTE   0,6
 9810  036740  170000                ,WORD   170000                  ;BUS TESTER SECTION 1&2
 9811  036742     000     010        ,BYTE   0,8,
 9812  036744  170020                ,WORD   170020                  ;BUS TESTER SECTION 3&4
 9813  036746     000     011        ,BYTE   0,9,
 9814  036750  177460                ,WORD   177460                  ;RF11
 9815  036752     000     012        ,BYTE   0,10,
 9816  036754  171774                ,WORD   171774                  ;UDC11
 9817  036756     000     013        ,BYTE   0,11,
 9818  036760  177440                ,WORD   177440                  ;RC11
 9819  036762     000     014        ,BYTE   0,12,
 9820  036764  177340                ,WORD   177340                  ;TC11
 9821  036766     000     015        ,BYTE   0,13,
 9822  036770  176756                ,WORD   176756                  ;AA11
 9823  036772     002     002        ,BYTE   2,2
 9824  036774  172570                ,WORD   172570                  ;AFC11
 9825  036776     002     003        ,BYTE   2,3
 9826  037000  177400                ,WORD   177400                  ;RK11
 9827  037002     002     004        ,BYTE   2,4
 9828  037004  172410                ,WORD   172410                  ;DR11-B
 9829  037006     002     005        ,BYTE   2,5
 9830  037010  176770                ,WORD   176770                  ;AD01-D
 9831  037012     002     007        ,BYTE   2,7
 9832  037014  176720                ,WORD   176720                  ;RP11
 9833  037016     002     010        ,BYTE   2,8,
 9834  037020  172520                ,WORD   172520                  ;TM11
 9835  037022     002     013        ,BYTE   2,11,
 9836  037024  173000                ,WORD   173000                  ;M792YA
 9837  037026     002     014        ,BYTE   2,12,
 9838  037030  173100                ,WORD   173100                  ;M792YB
 9839  037032     002     015        ,BYTE   2,13,
```

```
 5840  037034  000070                  .WORD  7
 5841          000021                  .END
```



```
A       035602          AANS1   035712          AAR0    036562          AAR1    036564
AAR2    036566          AAR3    036570          AA11    006566          AA11IV  000140
ABCA    001474          ABCSR   001500          ABDBR   001472          ABWC    001476
AC      001224          ACTFLG  001066          AC0     =%000000        ACI     =%000001
AC2     =%000002        AC3     =%000003        AC4     =%000004        AC5     =%000005
ADCK    006412          ADCONT  006516          ADCSR   001300          ADCSR0  001302
ADDBR   001276          ADLOOP  006434          ADSUB   024332          ADTBLA  006546
ADTBLB  006556          ADTEMP  006536          AD10    006304          AD11IV  000130
AD8101  035664          AD1     006342          AD1000  035670          AD1001  035666
AD2     006362          AD5T01  036040          AFADD   005700          AFCAR   001430
AFCIV   000134          AFCLR   005776          AFCOM   006056          AFCOM1  006100
AFCSR   001424          AFCTR1  006236          AFCTR2  006237          AFC11   005670
AFDBR   001426          AFEXA   006024          AFEXIT  006040          AFMOV   006156
AFMOV1  276020          AFPFLG  006242          AFPTR   006232          AFPTRA  006234
AFSEL   006246          AFSP2   005762          AFTAR1  006244          AFTAR2  006264
AFTEMP  006247          ANS1    036070          ANS2    036072          ANS3    036074
ANS4    036076          ANS5    036100          ANS6    036102          ANS7    036104
ANS8    036106          ARIEND  024410          ASCNT   035252          ASH     001244
ASHC1   025720          ASHC2   026014          ASH1    025604          ASH2    025666
B       035570          BBCA    001504          BBCSR   001510          BBDBR   001502
BBWC    001506          BDATA1  004510          BDATA2  004540          BEGIN1  001542
BEGIN4  002304          BELL    033324          BR      = 000002        BUST1   013750
BUST2   014062          BUST3   014144          BUST4   014516          BUSWT   = 033710
BUSY    = 000002        C       035614          CBBUF   014240          CBCA    001514
CBCSR   001522          CBCTA   014234          CBCTR   014236          CBDBR   001512
CBUS1   014072          CBUS3   014176          CBWC    001516          CDPA    001274
CDBUFF  025426          CDCC    001272          CDCHK1  005374          CDENDI  = 005666
CDENDP  = 005546        CDISR   005160          CDISR1  005200          CDLOP1  005262
CDLOP2  005312          CDRET   005346          CDRET1  005352          CDST    001270
CDTOP   = 005424        CHAR    006642          CHAR1   006664          CHAR2   006704
CHAR3   006734          CHAR4   007056          CHOUT   006540          CLINCT  012150
CLRMUX  = 002000        CLRSCN  = 004000        CMP1    023632          CMP2    023654
CNTR    036602          COMFIS  026274          COMFPP  026532          COMPAR  023426
  NFIG  001062          CORTSB  002236          CORTST  002212          CORTS1  002254
CRB1    001264          CRB2    001266          CRCHK1  004754          CRCHK2  005122
CRCHK3  005124          CRCHK4  005056          CRCHK5  005136          CRCHK6  005272
CRCK1   005152          CRCK2   005154          CRCLCT  005156          CRCM11  004714
CRCNT   005034          CRCONT  005022          CRDRIV  000230          CRDRPS  000232
CRS     001262          CRSUM1  005146          CRSUM2  005150          CRI     005710
CURPAT  212144          D       035634          DAC0    001326          DAC1    001330
DALTA   035714          DALTB   035724          DALTC   035734          DASH    036550
DATA3   004604          DATA4   004700          DBBUF   = 014240        DBCA    001524
DBCSR   001932          DBCTA   014602          DBCTB   014604          DBDBR   001522
DBIG    035672          DBUS1   014452          DBUS3   014544          DBWC    001526
DCBCNT  212614          DCDAT1  010634          DCDAT2  010722          DCDAT3  010762
DCBAT4  011252          DCINF   010746          DCIN1   010726          DCIN2   010732
DCIN3   012722          DCIN3A  011754          DCIN3B  011746          DCIN4A  011760
DCIN5   010674          DCIN5A  011724          DCOUT   010640          DCOUTA  010766
DCOUTF  010744          DCOUT1  010644          DCOUT3  010772          DCRBR   001416
DCRCSR  001414          DCRDBR  001412          DCRSR   001414          DCTCSA  001420
DCTCSR  001404          DCTDRA  001422          DCTDRR  001406          DCTRIV  000300
DCITIV  000304          DC11R1  010654          DC11R2  011702          DC11T1  010622
DC11T2  010754          DC2NIV  000310          DC2TIV  000314          DEFI    030774
DEVTAB  036734          DIV     001236          DIV1    026110          DIV2    026164
```

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DMBAR   001342    DMBAR1  011546    DMRAS   001346    DMRAT   011502
DMBCSR  001536    DMBEND  032426    DMRINT  032410    DMRLSR  001534
DMBLVL  001542    DMBHK   001344    DMRVEC  001536    DMSAT   011402
DMCSR   001340    DMMSK   011540    DMPRIA  034142    DMPRIB  034162
DMPRIC  004202    DMPRIM  004022    DMPTR   011544    DMRIMA  011256
DMRINB  011266    DMRINC  011272    DMRIND  011322    DMRIMX  011346
DMRPRT  001352    DMRVEC  001350    DMTDAT  011542    DMTIM   011122
DMTINA  011154    DMTINB  011212    DMTINX  011220    DMTIM1  011142
DMTPRT  001356    DMTVEC  001354    DMWCT   011440    DMXBT1  001132
DMXBTS  001034    DMZERO  035702    DN11PB  032216    DN11R   011226
DNI1P   011072    DNCSR   001332    DNEND   031430    DNFLG   031454
DNISR   031430    DNLVL   001336    DNVEC   001334    DNI1    031230
DO      = 000001  DONE    = 000200  DPESYN  001372    DPPB    001362
DPRDAT  010616    DPRIV   001374    DPRP    001376    DPPS    001360
DPSSR   010742    DPSSR1  011072    DPSYNC  001370    DPTB    001366
DPTDAT  010642    DPTIV   001400    DPTP    001402    DPTS    001364
DPTSYN  010612    DP11A   003714    DP11R   012462    DP11RA  012532
DPI1RB  010542    DP11RC  010564    DP11RR  010572    DP11T   012374
DRACCS  001126    DRACIB  001132    DRACNB  001130    DRACT   031456
DRACTI  031664    DRACTO  031666    DRACT1  031502    DRBA    001454
DRBIV   000124    DRBUF   031172    DRDBR   001450    DRENB   231232
DRENDA  031154    DRFLG   031166    DRILVL  001136    DRIR    031162
DRIVEC  001134    DROLVL  001142    DROVEC  001140    DRST    001452
DRWC    001456    DR11B   031052    DSMALL  035654    DTCSR1  001202
DTREL   033674    D0100   036704    D0100X  036716    D3101   035640
D0111   036024    D1000   036706    D1201   035646    D1212   035636
D20     035774    D37     035754    D40     035744    D46     035764
D5701   036034    ENDBOO  030612    ENDBUF  010142    ENDEAE  030342
ENDPAS  033412    ENDPAX  033606    ENDPA1  033624    ENDPRO  027564
ENDPI   033522    ENDP2   033536    ENDWAT  033116    EWAIT   035260
EXIT    033454    EXITCT  034342    EXLOP   026554    EXOPT   034206
EXPAND  033142    EXPAN1  033156    EXPAN2  033162    EXPAN3  033302
EXPIA   014064    EX4     026610    E,PUN   000760    F,TCSR  = 000762
E,PDB   = 000774  E,0     000636    F,1     000666    F,2     000700
E,3     000736    E,4     000750    F       = 000000  FARD    = 075400
FDIV    = 075032  FEA     036112    FEC     036110    FEND1   012206
FISSTK  026532    FLTERR  036056    FMUL    = 075222  FPREPF  036116
FPS     =X000000  FPTADR  036120    FPVECT  036122    FSUB    = 075210
FUNCTI  007542    F5T01   036042    GETSW   001220    HCORE   001156
HDPHM   035042    HERE    = 000000  HPCSR   001114    HPPBR   001116
HPLPEX  034722    HPOUTR  004422    HPOUT1  004402    HPOUT2  004476
HRCSR   001114    HRDBR   001112    HSPLSP  034462    HSRINR  004552    HSRIN1  004610    HSPIV   000070
HTESTL  033276    ICOUNT  001036    IE      = 000100  IMMI    032712
INTCNT  004712    INTENA  = 000100  IOTLVL  000022    IOTVEC  000020
ISCNT   035506    ISFLG   035510    ISOLAT  035520    ISOLA1  035362
ISOLA2  035536    ISO1    035376    ISO2    035414    ISO3    035426
ISR4    035434    ISO5    035456    ISWRD   035512    KDSAR0  = 172360
KDSDR0  = 172320  KGBCC   001466    KGCIT   032012    KGCP    032756
KGCSR   001464    KGC12   032014    KGDBR   001470    KGMP    032716
KGEND   032004    KGIP    032010    KGSTRT  031670    KGTA    031716
KGTEST  031700    KISAR0  = 172340  KISDR0  = 172300  KLIV    000100
KWCSR   001444    KWCSR   001442    KWCTR   001446    KWIV    000104
KWRATE  010354    KW11L   010352    KW11P   010214    KW11PA  010262
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KW11PB  010304    KW11PC  010326    LIGHTS  = 177570  LINKER  001732
LIST    035054    LISTND  035070    LKCSR   001120    LLIMIT  007542
LOCORE  001052    LOGICA  033506    LPCSR   001122    LPDBR   001124
LPINTR  012000    LPIN2   012074    LP1     012126    LP3     012134
LP3     012042    LP4     012052    LP5     012120    LSW     001242
LTESTL  033226    LTEST1  033236    MAINLI  004440    MAINS   004442
MAINT   = 001007  MANAG1  027030    MAP     034202    MAPA    034236
MAP1    034222    MAP1A   034204    MAP2    034246    MAP2A   034240
MARK0   025240    MARK0A  025246    MARK1   = 006401  MORE    026704
MQ      001224    MR11DB  030550    MR11D1  030560    MR11T2  030406
MRI103  030612    MTBC    001436    MTBKSP  007650    MTBKW   007672
MTC     001434    MTCA    001440    MTCK    010000    MTFK1   010026
MTCK2   010044    MTDATA  010072    MTIV    000224    MTLENG  010212
MTPD1   227754    MTRBUF  010074    MTPDX   007744    MTREAD  007712
MTRWX   007564    MTR0    010070    MTR1    007774    MTR2    007776
MTS     001432    MTWBUF  010144    MTWRIT  007566    MTWRTX  007420
MUL     001234    MUL1    025434    MUL2    025516    M792A1  030362
M792A2  030420    M792A3  030424    M792A4  030450    M792A5  030452
M792B1  030514    M792B2  030542    M792B3  030544    M792VA  032342
M792VB  030454    M       = 031230  NOOPT   034002    NOP     001240
NUMA    024404    N1      036555    OVFLAG  001026    P       036536
PASCNT  001040    PASCT   034330    PASEX   034326    PASPAR  034324
PASTAB  034332    PAS20   034320    PAS40   034310    PAS46   034260
PC      =X000000  PFAIL   035514    PFFLAG  035572    PIRLVL  000240
PIRQ    = 177772  PIRQA   027532    PIRQR   027536    PIRQFX  027540
PIRVEC  000240    PNTR    036600    POINTA  006542    POINTB  006544
PREG1   034540    PREG2   034550    PREG3   034560    PRFLAG  001042
PRIME   001022    PRINT   034352    PRINT1  034604    PRINT2  034424
PRINT3  034656    PROCTS  014406    PRTAB   034744    PRTAB1  034756
PS      = 177776  QVFLG   = 001067  R       = 000000  RB      = 000002
RCBAR   001172    RCCSR   001174    RCCSRH  001176    RCDAR   001166
RCDBR   001164    RCFUNC  007414    RCIV    000210    RCLA    001162
RCSTAR  007354    RCWC    001170    RCWORD  007416    RC11    007314
RC2     007362    RD      = 000004  RECIA   014056    REF     = 224056
REFF    024056    RENDE   012362    REND1   012412    RESTAR  035532
RESYNC  010444    RETURN  001064    RFCAR   001154    RFCSR   001156
RFCSRH  001160    RFD     003730    RFDAE   001144    RFDAR   001150
RFDBR   001146    RFIV    000204    RFSTAR  007502    RFWC    001152
RFI     007504    RF11    007420    RJMP1   016326    RJMP2   016344
RKBAR   001210    RKCSR   001214    RKCSRH  001216    RKDAR   001206
RKDAR   001204    RKDBR   001200    RKDRV   001222    RKDSR   001220
RKFUNC  007204    RKIV    000220    RKSTAR  007144    RKWC    001212
RKWORD  007200    RK1     007152    RK11    007174    ROTALL  033732
ROTBE   024074    ROTBO   024220    ROTEN1  024276    ROTVAL  033724
RPBAR   001314    RPCA    001304    RPCSR   001322    RPCSRH  001322
RPD     002652    RPDAH   001306    RPDAR   001312    RPDSR   001310
RPFUNC  007312    RPIV    000254    RPSTAR  007250    RPWC    001314
RPWORD  007310    RP1     007264    RP11    007210    RTTA    025424
RTYB    025416    RUNSW   002342    R0      =X000000  R1      =X000001
R2      =X000002  R3      =X000003  R4      =X000004  R5      =X000005
SAVADR  036052    SAVPC   034740    SAVPS   034742    SAVR0   034726
SAVR3   034734    SAVR4   034732    SAVSPA  034724    SAVSTS  034754
SC      001230    SCNENA  = 000042  SCNT1   032230    SCNT1A  032256
SCNT1B  032330    SCNT1D  032370    SCNT1E  032404    SCOPE   = 104420
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SCOPFA   035165          SCOPEB   035172          SCOPEC   035116          SCOPFF   021760
SCOPEG   035169          SCOPET   035076          SCSR     001324          SDSAR0 = 172260
SDSDR0 = 172220          SEGALL   034132          SEGERR   034152          SEGLVL   000252
SEGOPT   034014          SEGVEC   000250          SEG42    034106          SENDIA   014754
SETSW    002152          SISAR0 = 172240          SISDR0 = 172200          SIZER    036404
SOB1     025156          SOR2     025154          SOR3     025166          SOR4     025176
SOB5     025172          SOR6     025204          SOLPAT   012146          SP     = 000006
SR     = 177570          SRE      001232          SR1      001244          SR2      001246
SR3      001254          SSR0   = 177572          SSRUT    034200          SSP3   = 172516
ST       002352          STA      002452          STACK    036520          STACYK   036322
START    002032          STC2     004272          STC3     004360          STEP   = 000400
STMT     003674          STORE    036726          ST00     002634          ST01     002726
ST1      002744          ST1B     003434          ST1C     003466          ST1C1    003504
ST1D     003514          ST1D1    003540          ST12     003302          ST120    004424
ST11     003332          ST13     004272          ST17     003362          ST2      002752
ST3      002764          ST3B     003632          ST4      004367          ST4A     002776
ST5      003014          ST6      003362          ST7      003112          ST8      003152
ST9      003234          SUBR1A   035262          SUBR2A   035264          SUBR3A   035270
SUBR4A   035276          SUBR5A   035304          SUBSPA   035312          SWABA    024770
SWITCH   002160          TBPTR    006534          TCRA     001256          TCRM     001246
TCDRV    001260          TCDT     001252          TCEXPE   012162          TCFIPS   012156
TCFLAG   012152          TCF1     012236          TCF1A    012230          TCF2     012270
TCF3     012304          TCF4     012352          TCIV     020014          TCLAST   012160
TCOM     024430          TCOMA    024412          TCOM2    024512          TCOM7    024574
TCRBK    012664          TCRBUF   012750          TCRB1    012722          TCR1     012524
TCR1A    012566          TCR2     012574          TCR3     012610          TCR4     012656
TCSR     034734          TCST     001250          TCSTAT   012154          TCWBK    012436
TCWBUF   012750          TCWB1    012470          TC4C     001254          TC1      035174
TCI1     012164          TC2      035220          TDBR     034734          TEMP     035624
TEST     024760          TEST0    014626          TEXT     036522          TJSR1    023216
TJSR2    023220          TJSR3    023232          TM11     037546          TRCSR    001100
TRDR     001102          TRTRET   034710          TRTVEC = 000014          TSCOMB   024652
TSCOM1   024644          TSRT2A   024662          TSTART   024314          TS45     025726
TTCSR    001104          TTDBR    001106          TTPIV    020064          TTPIV    000260
TTYINR   004456          TTYIN1   004514          TTYIN2   004520          TTYIT3   004536
TUMTAB   011000          TV19     010420          TWAIT    035244          TXT1     006634
TYOUTR   004524          TYOUT1   004542          TYOUT2   004552          T18      010416
T19      010462          UDCN     001460          UDC11    030612          UDFLG    031050
UDINT    231025          UDIV     000234          UDPS     000236          UDSAR0 = 177460
UDSDR0 = 177620          UDSR     001462          UISAR0 = 177640          UISDR0 = 177600
UM     = 140000          WAITS    027602          WAIT1    027714          WAIT2    035020
WAIT3    027644          WAIT4    027732          WATCAB   032544          WATCAD   033052
WATCAF   033004          WATCBB   032560          WATCCB   032602          WATCCB   032416
WATCDM   033114          WATCDP   033074          WATCH    032426          WATCKL   032476
WATCKP   032522          WATCRC   032720          WATCRF   032640          WATCRK   033030
WATCUD   032674          WATCUI   032662          WATDC1   032742          WATDC2   032764
WAT1     032502          WAT10    033010          WAT12    033032          WAT13    033054
WAT14    033076          WAT15    033116          WAT2     032524          WAT3     032562
WAT4     032602          WAT5     032642          WAT6     032700          WAT7     032722
WAT8     032744          WAT9     032766          WD     = 000014          WEIRD    035654
WORDCT   007744          XD       036543          XLIST    035512          XOR1     025742
XPOS     036574          XTC11    012360          YPOS     036572          YPT      036576
,DMPRT = 000200          ,DONE  = 000080          ,GO    = 000001          ,MAINT = 000004
,NEX   = 040000          ,OVRUN = 020000          ,READY = 100000          ,RIE   = 000100
```



```
,TYE   = 010000          ,TYPE    036114          .      = 037736
```

ERRORS DETECTED: 0

```
 *DZQGAC,DZQGA?/SQL=DZQGAC,P11
 RUN-TIME: 22 40 1 SECONDS
 CORE USED:  5K
```